SELECTED WATER RESOURCES ABSTRACTS

VOLUME 8, NUMBER 10
MAY 15, 1975

W75-04851 -- W75-05350
CODEN: SWRABW

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 8, NUMBER 10
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

WATER AND AQUEOUS SOLUTIONS: INTRODUCTION TO A MOLECULAR THEORY,
Hebrew Univ., Jerusalem (Israel). Inst. of Chemistry.
A. Ben-Naim.
Plenum Press (New York and London), 1974. 474 p.

Descriptors: *Molecular structure, *Aqueous solutions, *Water structure, Thermodynamic behavior, Water properties, Theoretical analysis, Mathematical studies, Solutes, Liquids, Statistical methods, Equations, Mathematics, Numerical analysis, Water chemistry.
Identifiers: Molecular distribution functions.

The molecular theory of water and aqueous fluids, based on the general theory of liquids and mixtures is discussed. Rudiments of statistical mechanics needed for understanding the rest of the book are described. Chapters 2-4 develop molecular distribution functions and thermodynamic behavior, with emphasis on fluids consisting of nonspherical particles. Chapter 5 connects the formal theory of fluids, including the mixture-model approach, with its applications to water and complex aqueous solutions. Properties of pure water and of water containing 1 or 2 solutes are discussed in Chapters 6-8, including hydrophobic interactions. Mathematical derivations, a glossary of abbreviations, literature citations, and an index are appended. (Brown-IPC)
W75-04970

CONTINUOUS RANDOM NETWORK MODEL FOR AMORPHOUS SOLID WATER,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Magnetisme.
R. Alben, and P. Boutron.
Science, Vol 187, No 4175, p 430-432, February 7, 1975. 3 fig, 14 ref.

Descriptors: *Model studies, *Structural models, *Water structure, *Ice, *Water properties, Structure, X-rays, Hydrates, Testing, Chemical properties, Physical properties, Water, Heavy water, Chemical analysis, X-ray analysis, Physical properties, Model studies.
Identifiers: *Continuous random network, *Amorphous solid water, Coordination relationships, Metal tetrahedral units, Plastic tetrahedral units, Scattering.

Continuous random network models representing amorphous solid water were constructed. The x-ray and neutron scattering predictions for one type of model agree quite well with experimental results. (Henley-ISWS)
W75-05161

AMORPHOUS SOLID WATER: A NEUTRON DIFFRACTION STUDY,
Atomic Energy Research Establishment, Harwell (England).
J. Wenzel, C. U. Linderstrom-Lang, and S. A. Rice.
Science, Vol 187, N0 4175, p 428-430, February 7, 1975. 4 fig, 10 ref.

Descriptors: *Heavy water, *Ice, *Water structure, *Radioactivity techniques, *Water properties, Analytical techniques, Spectroscopy, Chemical properties, Physical properties, Radioactivity, Water quality, X-ray diffraction, Hydrogen bonding, Crystals, Deuterium, Spectrometers.
Identifiers: *Neutron diffraction, *Structure factor, *Amorphous solid D20, Intramolecular separation, Scattered neutron intensity, Wave vector transfer, DR-3 reactor.

The structure factor of amorphous solid D20 deposited from the vapor at 10K was obtained by measuring the neutron diffraction spectrum in the wave vector transfer from 0.8 to 12.3 reciprocal angstroms. The results indicated that the phase investigated is amorphous and has a liquid-like structure factor. The Fourier-transformed structure factor yielded a real space pair distribution function consistent with local tetrahedral coordination and hydrogen bonding, as in other condensed phases of water. The intra-molecular OD separation is 1.00 angstrom; the lack of data for very large wave vector transfer and the expected near equality of the intramolecular DD separation and inter-molecular O ... D separation made it impossible to determine the intramolecular DOD angle with precision. The neutron scattering data presented were complementary to the x-ray diffraction studies of Venkatesh, Rice, and Narten. (Henley-ISWS)
W75-05169

2. WATER CYCLE

2A. General

EXTENSION OF HYDROLOGIC PROCESS MODELING TO TOTAL WATERSHED MODELING,
Agricultural Research Services, Beltsville, Md. Hydrograph Lab.
C. B. England.
In: Biological Effects in The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 240-247. 4 fig, 10 ref.

Descriptors: *Model studies, *Synthetic hydrology, *Evapotranspiration, *Infiltration, Percolation, Analytical techniques, Lysimeters, Soils, Land use, Hydrologic data, Streamflow, *Ohio.
Identifiers: *Coshocton(Ohio).

In modeling the performance of watersheds, especially for agricultural research purposes, it is important to simulate not only the outflow hydrograph but also the internal hydrologic processes. This requires the use of comprehensive distributed-parameter models which permit consideration of storage distribution, paths, and rates of flow. One such model USDAHL-70 Model of Watershed Hydrology, has been developed at the USDA Hydrograph Laboratory. The digital computer program of this model includes separate and distinct subroutines, one for each hydrologic process, such as percolation and infiltration, evapotranspiration, partitioning of watersheds into soil-landform zones by grouping units similar soil and land use, and cascading of flows from zone to zone. The model was applied to synthesize monthly flows for the watershed W-97, Coshocton, Ohio. The observed and synthesized monthly flows were generally in good agreement. (See also W75-03023) (Singh-ISWS)
W75-04924

STORMFLOW PRODUCTION FROM PERMEABLE UPLAND BASINS,
Georgia Univ., Athens. School of Forest Resources.
W. L. Nutter, and J. D. Hewlett.
In: Biological Effects In The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 248-258. 6 fig, 19 ref.

Descriptors: *Model studies, *Storm runoff, *Hydrologic systems, *Subsurface runoff, Demonstration watersheds, *Watersheds(Basins), Hydrologic data, Small watersheds, Subsurface drainage, Humid areas, Hydrology, Rainfall-runoff relationships, Infiltration, Hydrologic equation, Discharge(Water), Floodwater.
Identifiers: Conceptual models.

A conceptual source area model was proposed which indicated that subsurface storm flow is the dominant source of flood waters from most non-urban watersheds in humid regions. The model was based on the assumption that infiltration is not usually a limiting process and overland flow exists only to the extent implied in the term 'over-water flow' or 'channel precipation.' The advantage of the variable source area concept is that it represents the actual physical processes occurring on the basin. The concept should produce a more generally applicable explanation of storm flow production than a traditional overland flow model. Data from demonstration watersheds were presented to show substantial subsurface storm flow in the average flood hydrograph. (See also W75-03023) (Humphreys-ISWS)
W75-04925

MULTIDIMENSIONAL CHARACTERIZATION OF THE RAINFALL PROCESS, PART I: SYNTHETIC GENERATION OF HYDROLOGIC SPATIAL PROCESSES, PART II: ON THE TRANSFORMATION OF POINT RAINFALL TO AREAL RAINFALL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-04930

ON THE COLLECTION, THE ANALYSIS AND THE SYNTHESIS OF SPATIAL RAINFALL DATA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-04931

BIDIMENSIONAL SPECTRAL ANALYSIS OF RAINFALL EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-04932

A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME I: SUMMARY REPORT.
IBM Federal Systems Div., Huntsville, Ala.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-27813, $4.25 in paper copy, $2.25 in microfiche. IBM Report No 74W-00175, June 1974. 40 p, 13 fig, 6 tab, 15 ref, 1 append. NASA Contract No. NAS5-21942.

Descriptors: *Small watersheds, *Regional analysis, *Remote sensing, *Hydrologic models, *Watersheds(Basins), Streamflow, Simulation analysis, Analytical techniques, Computer models, Measurement, Hydrology, Rainfall-runoff relationships, Model studies.
Identifiers: Sensitivity analysis.

A study was conducted to determine how accurate remotely sensed measurements must be to provide inputs to hydrologic models of watersheds, within the tolerances needed for acceptably accurate synthesis of streamflow by the models. At present, remote sensing from space is directly applicable to determination of model parameters related to prominent surface features such as land use vegetation, overland distances, snow coverage, and water and impervious surfaces. Permissible tolerances in the parameters associated with these features are large enough not to impose stringent

resolution requirements. Eight of the parameters can be quantified from Skylab and ERTS image data. A sensitivity analysis quantified permissible tolerances for several other inputs and parameters, and their corresponding image resolutions. This information will be applicable in the future to systems and techniques that are presently under study. (See also W75-05109) (Sims-ISWS)
W75-05108

A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME II: SUPPORTING TECHNICAL DETAILS.
IBM Federal Systems Div., Huntsville, Ala.
Available from the National Technical Information Service, Springfield, Va as N74-30833, $10.50 in paper copy, $2.25 in microfiche. IBM Report No 74W-00176, 1974. 438 p, 50 fig, 159 tab, 21 ref, 4 append.

Descriptors: *Small watersheds, *Regional analysis, *Remote sensing, *Hydrologic models, *Watersheds(Basins), Model studies, Data collections, Hydrology, Simulation analysis, Computer models, Streamflow, Analytical techniques, Rainfall-runoff relationships.
Identifiers: Sensitivity analysis.

Volume II contains detailed technical material that supplements and supports the study presented in Volume I on the application of remote sensing to regional and small watersheds. Described in detail were the watershed simulation models, and the sensitivity analysis procedures, which showed quantitatively how variations in each of the 46 model inputs and parameters affect simulation accuracy. Portions of watershed model simulation run outputs were contained in appendixes. Abstracts of related technical articles were also presented in an appendix. (See also W75-05108) (Sims-ISWS)
W75-05109

APPLICATION OF REMOTE SENSING TO HYDROLOGY.
IBM Federal Systems Div., Huntsville, Ala.
Available from the National Technical Information Service, Springfield, Va. 22161, as N74-27811, $5.25 in paper copy, $2.25 in microfiche. IBM Report No. 73W-00387, September 1973. 99 p, 32 fig, 17 tab, 18 ref, 3 append. NASA NAS8-14000/SA 2171.

Descriptors: *Feasibility studies, *Remote sensing, *Hydrologic models, Simulation analysis, Hydrology, Computer models, Watersheds(Basins), Rainfall-runoff relationships, Model studies.

A study was conducted to assess the feasibility of using the data produced by remote observation from space and/or aircraft to reduce the time and expense normally involved in achieving the ability to predict the hydrological behavior of an ungaged watershed. Such a capability will enhance effective planning for urban and industrial development, flood control, hydroelectric power, navigation, and water resources management. Traditionally, the ability to predict streamflow rates, in response to given precipitation, is attainable only after installation of extensive instrumentation and collection of data for several years to estimate the operating parameters of a model of the basin or watershed system. A simulation model was developed by using historical data from gaged watersheds which predicts the hydrological behavior of an ungaged watershed. Input to this model consists of standard climatological data and parameters describing the watershed's physical characteristics as obtained from aerial photography. (Sims-ISWS)
W75-05131

PERMAFROST HYDROLOGY.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2C.
W75-05138

GEOLOGY AND PERMAFROST IN RELATION TO HYDROLOGY AND GEOPHYSICS,
Geological Survey of Canada, Calgary(Alberta).
For primary bibliographic entry see Field 2C.
W75-05141

PERMAFROST-HYDROLOGY STUDIES AT BOOT CREEK AND PETER LAKE WATERSHEDS, N.W.T.,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W75-05143

RUNOFF FROM A SMALL ARCTIC WATERSHED,
Water Survey of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 2C.
W75-05144

ENERGY BALANCE CONSIDERATIONS IN PERMAFROST HYDROLOGY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 2C.
W75-05147

BIBLIOGRAPHIES PERTINENT TO WILDLAND HYDROLOGY,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 10C.
W75-05153

CONTINUOUS HYDROLOGICAL TIME-SERIES DISCRETIZATION,
Technical Univ. of Lisbon (Portugal). Instituto Superior Tecnico.
L. V. Tavares.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY1, Proceedings paper 11063, p 49-63, January 1975. 7 fig, 1 tab, 3 ref, 2 append.

Descriptors: *Hydrology, *Hydrologic data, *Hydraulics, *Time series analysis, Estimating equations, Optimization, Parametric hydrology.
Identifiers: Discrete distribution functions.

The available information about many continuous hydrological time series X sub t is often given by continuous time records with given finite duration and in many cases (i.e., rainfall and runoff records) the autocovariance function of X sub t can be approximated by a function of exponential type. Once the data have been deseasonalized, stationarity is usually assumed. A discretization technique is required to estimate the mean and the variance of X sub t which implies setting a value for the lag of time, L, between any two successive observations taken from the continuous record. The greater the time lag, the smaller is the number of used X sub t values, the weaker is the dependence between them, and the shorter is the required computing time. The three effects were studied to make possible the selection of an optimal value for L. Numerical results of general use were derived and presented. These conclusions also can be applied to any nonhydrological time series providing the assumed statistical assumptions are acceptable. (Dawes-ISWS)
W75-05165

SOIL-WATER PRESSURE DURING INTERMITTENT SIMULATED RAIN APPLICATION MEASURED WITH A NEW RAPID-RESPONSE TENSIOMETRIC TECHNIQUE,
Agricultural Research Service, Morris, Minn. North-Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2G.
W75-05181

MODELING THE HYDROLOGIC EFFECTS RESULTING FROM LAND MODIFICATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and C. C. Kisiel.
Transactions of the American Society of Agricultural Engineers, Vol 17, No 6, p 1006-1010, November-December 1974. 3 fig, 1 tab, 23 ref.

Descriptors: *Model studies, *Land management, *Hydrologic aspects, *Erosion rates, *Rainfall disposition, *Rainfall-runoff relationships, *Sediment load, Synthetic hydrology, Runoff forecasting, Simulation analysis, Urbanization, Watersheds(Basins).
Identifiers: Event-based approach, Bivariate gamma probability function.

A methodology was presented for predicting the long-term hydrologic effects of land modification in ungaged watersheds. The essential components of this procedure are an event-based stochastic model of precipitation as input and a deterministic watershed model that transforms the input into such desired hydrologic variables as water yield, peak runoff rate, and sediment yield. Land use can cause changes in water yields, flood probabilities, erosion rates, and sediment transport. Commonly used procedures for estimating runoff from watersheds are engineering design approaches, statistical approaches, regional analysis, and simulation. Simulation provides a continuous hydrograph, and allowances for changes in precipitation, land use, etc., can be made in the model. The proposed procedure uses Soil Conservation Service methods for relating runoff to rainfall and estimating the peak rate of surface runoff. The distribution of peak runoff considers all possible combinations of rainfall and storm duration. Sediment yield is considered as a function of both peak flow rate and the volume of runoff. The proposed procedures can be used to determine the effect of watershed treatment as the optimum size of floodwater retarding structures. (Singh-ISWS)
W75-05189

INVESTIGATION OF ALTERNATIVE PROCEDURES FOR ESTIMATING GROUNDWATER PARAMETERS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 4B.
W75-05263

GTWS: GEORGIA TECH WATERSHED SIMULATION MODEL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
A. M. Lumb, F. Currie, T. D. Hassett, and J. Zorich.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 937, $00.00 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC-0175, January 1975. 241 p, 30 fig, 44 tab, 42 ref, 8 append. OWRT A-047-GA(1). 14-31-0001-4010.

Descriptors: *Parametric hydrology, Hydrologic budget, Streamflow, *Surface runoff, Low flow, *Model studies, *Synthetic hydrology, Precipitation(Atmospheric), Hydrologic data, Optimization, Georgia, Interflow, Baseflow, Computer programs, *Watershed management.
Identifiers: *Stanford Watershed Model, *Pattern search, Computerized optimization, Continuous streamflow simulation.

The Georgia Tech Watershed Simulation Model provides a continuous deterministic simulation of streamflow from precipitation data and was specifically developed to help students better comprehend the complex interaction of flow processes and storages in the land phase of the hydrologic cycle. The total program contains two options: (1) direct use of the Stanford Watershed Model, and (2) use of supplemental features developed at Georgia Tech and representing additional storages and processes. Detailed documentation of the equations and listings of the program and the input data are provided. Required input to the model includes values for parameters representing watershed characteristics, and precipitation and evaporation amounts by time increments chosen for the simulation. Streamflow data can be entered in order to print or plot comparisons between simulated and recorded flows. The watershed parameters may be estimated by trial and error or by an outlined and illustrated self-calibrating pattern search optimization routine. Studies are described in which the Model was used (1) to analyze the effects of raingage density, type, and location on the accuracy of simulated streamflow and (2) to compare simulated streamflows with those estimated by regression analysis for a study of low-flow frequency. The sensitivity of estimated parameter values to precipitation, evaporation, and streamflow data errors is also examined. (James-GeoTech)
W75-05271

2B. Precipitation

A WATER BALANCE RECORDER FOR HYDROCLIMATIC AND AGROCLIMATIC MEASUREMENT OF PRECIPITATION AND EVAPORATION,
For primary bibliographic entry see Field 2D.
W75-04914

MULTIDIMENSIONAL CHARACTERIZATION OF THE RAINFALL PROCESS, PART I: SYNTHETIC GENERATION OF HYDROLOGIC SPATIAL PROCESSES, PART II: ON THE TRANSFORMATION OF POINT RAINFALL TO AREAL RAINFALL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
J. M. Mejia, and I. Rodriguez-Iturbe.
Available from National Technical Information Service Springfield, Va. 22161, as PB-239 855, $4.25 in paper copy, $2.25 in microfiche. Report No. 177, November 1973. 53 p, 8 fig, 3 tab, 6 ref. OWRT C-4118 (No. 9021)(6).

Descriptors: *Model studies, *Spatial distribution, *Synthesis, Estimating, Areal, *Rainfall, *Temporal distribution, Hydrologic data, Rainfall-runoff relationships, Methodology.
Identifiers: *Synthetic rainfall generation.

Part I: A procedure for the synthesis of processes exhibiting temporal and spatial variability is presented. The method involves the addition of harcsnics of random frequencies which are sampled from the spectral density function or the readial spectral density function. The process obtained is asymptotically Gaussian and ergodic. An estimate of the error in time or space averages due to the non-ergodicity of the process as function of the number of harmonics is also included. Part II: A general methodology is developed for the transformation of point rainfall to areal rainfall. The reduction factor is shown to depend solely on the expected correlation coefficient between the point rainfall at two randomly chosen points in the area in consideration. The methodology can be used to characterize the input to rainfall-runoff models and it includes the case in which multiple inputs are used in the model in the form of a subdivision in modules of the whole catchment. An example is worked out discussing the different methodologies for the estimation of total mean volume of rainfall over an area.
W75-04930

ON THE COLLECTION, THE ANALYSIS AND THE SYNTHESIS OF SPATIAL RAINFALL DATA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Lenton, and I. Rodriguez-Iturbe.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 856, $7.25 in paper copy, 2.25 in microfiche. Report No 194, October 1974. 218 p, 25 fig, 22 tab, 52 ref, 7 append.

Descriptors: *Data collections, Areal, *Model studies, Synthesis, Spatial distribution, Stochastic process, Climatic data, *Rainfall disposition, Hydrologic data, *Rainfall intensity.
Identifiers: Data analysis(Rainfall), *Data synthesis(Rainfall).

This study is concerned with developing a systematic approach to the design of programs of rainfall data management, which include the collection, the analysis and the synthesis of rainfall data. The collection and analysis of data, processed for the purpose of estimating areal averages of rainfall, is formulated as as mathematical programming problem whose objective function is the minimization of the cost and mean square error of the network, and whose decision variables are the total number of raingages, the coordinates of each of them, and the estimator weights. A two-stage methodology is proposed, wherein the optimal configuration of the network is determined first, followed by the optimal estimator weights. The synthesis of processes of areal averages of rainfall is treated by proposing an extension to a previous model of point rainfall synthesis. The proposed model generates sample functions of a random process of areal rainfall averages that preserve its areal covariance structure. The possibility of using point and areal rainfall models as an aid to decision making in network design problems is considered. The problem of inferring the characteristics of extreme values of areal rainfall is also studied. The distribution of the annual areal rainfall maximum per event is derived.
W75-04931

BIDIMENSIONAL SPECTRAL ANALYSIS OF RAINFALL EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. E. Rhenals-Figueredo, I. Rodriguez-Iturbe, and J. C. Schaake, Jr.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 797, $7.25 in paper copy, 2.25 in microfiche. Report No 193, November 1974. 214 p, 47 fig, 14 tab, 60 ref, 3 append. OWRT C-4118(No.9021)(7).

Descriptors: *Storms, *Model studies, *Stochastic processes, Numerical analysis, Fourier Analysis, *Rainfall, *Correlation analysis.
Identifiers: *Spectral analysis(Bidimensional), Double Fourier analysis.

In order to study the characteristics of the regional component, a number of storms over a given area are analyzed. For each storm, a double Fourier analysis of the total storm depths is performed, and the principal harmonics of the storm are determined. This analysis is aimed to investigate whether or not there exists a persistent pattern in total storm depths over a given area. The local component, or storm residuals, is obtained by subtracting the periodic component of the storm from the total storm depths. It is assumed that the residuals of each storm are a sample function of a homogeneous random field, which, in principle, may be different for each storm. The characteristics of each underlying random field are analyzed by using the bidimensional autocorrelation function of the residuals of each storm. The observation of these functions has led to the conclusion that it is reasonable to assume that the random fields are also isotropic, and therefore, each one can be characterized by an isotropic one-dimensional autocorrelation function or its corresponding spectral density function. A theoretical model for the isotropic normalized autocorrelation function is proposed and discussed. The corresponding spectral density function and the radial spectral density function are analytically determined, and a comparison is made of the empirical spectral density function and the theoretical one for several storm residuals.
W75-04932

OPTIMIZING THE MEASUREMENT OF CONVECTIVE RAINFALL IN FLORIDA,
National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.
W. L. Woodley, A. Olsen, A. Herndon, and V. Wiggert.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11554, $5.25 in paper copy, $2.25 in microfiche. NOAA Technical Memorandum ERL WMPO-18, July 1974. 99 p, 21 fig, 10 tab, 23 ref, 3 append.

Descriptors: *Precipitation(Atmospheric), *Radar, *Rain gages, Correlation analysis, Measurement, Cloud seeding, *Florida, Convection, Rainfall, Optimization.
Identifiers: Radar-derived rainfall, Gaging requirements, Radar digitizer, Beam filling, Anomalous propagation.

The optimum methods of convective precipitation measurement as a function of specified accuracy and area size over which the measurements are to be made were discussed. These methods involve gages or S-band radar or a combination of the two. The various methods were compared in the context of the continuing multiple cloud seeding experiment of the Experimental Meteorology Laboratory. The combined accuracy of the WSR-57 radar in 1972 and 1973 in estimating convective rainfall approximated the accuracy that would be obtained with a gage density of 25 sq mi/gage over an area the size of the measonetwork. When the radar estimate of rainfall was adjusted by comparison to precipitation gages, the radar estimates had an approximate gage density equivalence of 10 sq mi/gage. The gage and radar comparisons were compiled in their entirety for use by other scientists. (Jones-ISWS)
W75-05097

MICROSTRUCTURE OF PRECIPITATION DEPOSITED ON HORIZONTAL SURFACES IN FOG,
L. Z. Prokh.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 742, $3.25 in paper copy, $2.25 in microfiche. April 15, 1974, 12 p, 2 fig, 3 tab, 9 ref. Translated from Trudy Nauch.-Issled. Gidrometeorol. Inst. (Kiev), No 42, p 36-41, 1964.

Descriptors: *Fog, *Water balance, *Precipitation(Atmospheric), Air masses, Topography, Terrain analysis, On-site investigations, Drop(Fluids), Distribution patterns, Measurement.
Identifiers: *Fog deposition, Soils, Thermal regime, Microphotographs, *USSR(Ukraine).

Microphotographs of fog droplet deposition on a horizontal surface were obtained in the Ukraine under a number of conditions of wind speed and direction and air mass. The droplet size was largest during the daylight hours and decreased to median size toward the hours of darkness. However, the depth of deposition was four times less during the day than the depth at night because of the decrease in the total number of settling drops. When southerly winds prevail, the rate of fog deposition on a horizontal service can be ten times the

average rate, and on the windward side of obstacles it can be one hundred times greater. (Jones-ISWS)
W75-05101

DISTRIBUTION OF MEAN MONTHLY PRECIPITATION AND RAINFALL INTENSITIES,
Army Engineer Topographic Lab., Fort Belvoir Va. Geographic Sciences Lab.
T. E. Niedringhaus.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-781 951, $4.25 in paper copy, $2.25 in microfiche. Special Report ETL-SR-72-5, November 1972. 30 p, 18 fig, 11 ref.

Descriptors: *Precipitation intensity, Rainfall intensity, Precipitation(Atmospheric), Probable maximum precipitation, Rainfall, Rainfall disposition, Probability, Isohyets, *Distribution patterns.
Identifiers: Mean monthly precipitation, Precipitation belts.

The best available information concerning the worldwide distribution of monthly precipitation amounts and rainfall intensities was presented in order to provide an improved basis for the establishment of environmental criteria for the design and testing of Army Aviation (V/STOL) aircraft. The data were presented in a series of maps, including: mean monthly precipitation for January, April, July, and October; rainfall intensities equalled or exceeded 1.0, 0.5, and 0.1% of the time during January, April, July, and October in Eurasia; and rainfall amounts for 30-minute durations with a 10-year return period in Canada, conterminous United States, the Hawaiian Islands, and Puerto Rico. The areas of minimum and maximum values were discussed. The maximum precipitation amounts and intensities were found in the tropics, especially in South and Southeast Asia. (Jones-ISWS)
W75-05105

PRECIPITATION MECHANISMS IN SUMMERTIME CONVECTIVE CLOUDS,
Meteorology Research, Inc., Altadena, Calif.
For primary bibliographic entry see Field 3B.
W75-05111

NUMERICAL MODELS FOR PRECIPITATION SCAVENGING,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
For primary bibliographic entry see Field 5B.
W75-05112

JEMEZ ATMOSPHERIC WATER RESOURCES RESEARCH PROJECT, VOLUME I: SUMMARY AND ACCOMPLISHMENTS,
New Mexico State Univ., University Park. Engineering Experiment Station.
For primary bibliographic entry see Field 3B.
W75-05121

JEMEZ ATMOSPHERIC WATER RESOURCES RESEARCH PROJECT, VOLUME II: SPECIAL ASPECTS OF THE PROGRAM,
New Mexico State Univ., University Park. Engineering Experiment Station.
For primary bibliographic entry see Field 3B.
W75-05122

A STUDY OF RAINFALLS RECORDED AT THE CHERRAPUNJI OBSERVATORY,
Institute of Tropical Meteorology, Poona (India).
O. N. Dhar, and S. M. T. Farooqui.
Hydrological Sciences Bulletin, Vol 18, No 4, p 441-450, December 1973. 3 fig, 4 tab, 19 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Rain gages, Monsoons, Winds, Probable maximum precipitation, Statistical methods, Regression analysis, Correlation analysis, Orography.
Identifiers: *India(Cherrapunji Observatory).

The maximum rainfalls recorded at the Cherrapunji Observatory raingage during various periods within the 57 years from 1903 to 1959 were studied and the equation of the enveloping line was found to be R = 49 D to the 0.485 power where R is the rainfall in inches and D is duration in days. One-day maximum rainfalls for different periods from 2 to 100 years were also worked out and the 100-year value was found to be 2.1 times the 2-year value. The daily probable maximum precipitation, estimated by the Hershfield technique was 78 inches. A study of annual and monsoon rainfalls did not show any general linear trend, but there was a gradual increase in amounts from 1944 to 1954. (Jones-ISWS)
W75-05158

RAINFALL TEMPORAL PATTERNS FOR DESIGN FLOODS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim, and I. Cordery.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No NY1, Proceedings paper 11057, p 81-95, January 1975. 4 fig, 4 tab, 38 ref, 1 append.

Descriptors: *Rainfall, *Storms, *Antecedent precipitation, *Hydraulics, Hydrology, Rainfall intensity, Temporal distribution, Floods, Frequency, Flood control, Design storm, Design flood, Design, Australia.

The rainfalls used in the practical estimation of design floods are generally based on frequency-duration relationships derived from recorded intense burst of rainfall of various durations rather than from complete storms. These recorded intense bursts were therefore used in the derivation of the temporal patterns. The method produced patterns that incorporate average variability of intense rainfall and also the most likely sequence of intensities. Use of these patterns should minimize the introduction of joint probabilities into the design flood model and aid in estimation of a flood with the same frequency as the design rainfall. The method provides patterns with average or typical variations in intensity, in contrast to simple averaging which was shown to be generally unlikely to yield satisfactory patterns. Frequency distributions of rainfall during various periods immediately antecedent to the recorded intense bursts were also derived, and these antecedent rainfalls in flood estimation were considered. (Dawes-ISWS)
W75-05166

ANALYSES OF THE EFFECT OF URBANIZATION ON RAINFALL CHARACTERISTICS I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-05172

PROBABILISTIC ANALYSIS AND SIMULATION OF THE SHORT TIME INCREMENT RAINFALL PROCESS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. A. Rao, and B. T. Chenchayya.
Available from the National Technical Information Service, Springfield Va. 22161, as BP-239 872, $5.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 55. 1974. 102 p, 40 fig, 21 tab, 23 ref, 1 append. OWRT B-025-IND (1).

Descriptors: *Rainfall, *Propability, Precipitation(Atmospheric), Hyetographs, Time Lag, Storms, Correlation analysis, Model studies, Regression analysis, Time series analysis.
Identifiers: *Wet and Dry Sequence, Rainfall probability.

This study analyzes the characteristics of short time increment (10 minutes and hourly) rainfall sequences. The objectives were (1) to investigate the probability distribution which best fit the durations of wet and dry sequences, (2) to investigate the models proposed for storm depths and durations and for the time distribution of rainfall, (3) to investigate the characteristics of short time increment rainfall in different climatic zones and (4) to investigate the effect of different time scales on modelling the process. Results obtained were that the Weibull distribution best fit the distributions of the duration of wet and dry sequences, although the exponential distribution was also adequate. The regression models for storm depth-duration relationship were found adequate when they were used with appropriately classified storms. Significant differneces and some surprising similarities were found in the characteristics of short time increment, rainfall processes in different climatic regions. Finally, the characteristics of the 10 minute and hourly data are quite similar to each other.
W75-05173

EXPERIMENTAL STUDY OF RILL EROSION,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-05178

AIR PRESSURES OVER SURFACES EXPOSED TO WIND - I. WATER HARVESTING CATCHMENTS,
Agricultural Research Service, Water Conservation Lab. Phoenix, Ariz.
For primary bibliographic entry see Field 3B.
W75-05179

SECOND ANNUAL REPORT, DOT-CIAP PROGRAM,
California Univ., Livermore. Lawrence Livermore Lab.
M. C. MacCracken.
Available from NTIS, Springfield, Va. 22161 as Report No UCRL-51336-74, $7.60 in paper copy, $2.25 in microfiche. Report UCRL-51336-74, p 172, July 1974. 8 append.

Descriptors: *Transportation, *Aircraft, *Climatology, *Atmosphere, Pressure, *Meteorology, *Winds, *Model studies, Dispersion, Computer models, Climatic data, Radioactivity, Kinetics, Movement, Transfer, Energy, Zoning, Regions.
Identifiers: Transport, Global, Stratosphere, Monographs.

The Department of Transportation (DOT) through its Climatic Impact Assessment Program (CIAP) is seeking to determine the effects on global climate that would result from large numbers of aircraft operating in the stratosphere. The results of these studies will be published in a series of monographs in 1974. As a contributor to this program, Lawrence Livermore Laboratory (LLL) has undertaken a number of studies emphasizing numerical model development and application. Activities for the past year are summarized and projections for the next year are presented. Summary discussions of each of the numerical models and of participation in preparing input for the monographs are included. Appendices contain detailed descriptions of activities in these same areas. (Houser-ORNL)
W75-05349

2C. Snow, Ice, and Frost

RESEARCH PROJECTS IN GLACIOLOGY - 1974,
Department of the Environment, Ottawa, (Ontario). Inland Water Directorate.
Water Resources Branch, Report No 36, 1974, 130 p.

Descriptors: *Glaciology, *Research facilities, *Arctic, Hydrology, Remote sensing, Instrumentation, Snow cover, Ice cover, Avalanches, *Glaciers, Mapping, Bibliographies, Cryogenics, Crystalography, *Canada, Projects.
Identifiers: *Ice properties, Mackenzie Valley(Canada), Northwest Territories(Canada).

This report is the fifth in a series outlining the Glaciological Research Program of the Water Resources Branch of the Department of the Environment. The first section summarizes the objectives and organization of the group, while the second provides a catalogue of individual research projects. Project descriptions include the name of the investigator, the objectives of the research, the location of the research, the work underway, and the future program. A list of the publications by members of the glaciology division is also presented. (Environment Canada)
W75-04884

SNOW INTERCEPTION AND REDISTRIBUTION IN THE FOREST,
Forest Service(USDA), Fort Collins, Colo., Rocky Mountain Forest and Range Experimental Station.
M. D. Hoover.
In: Biological Effects In The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 114-122. 1 fig, 1 tab, 21 ref.

Descriptors: *Snow cover, *Snow surveys, *Snow, *Colorado, Precipitation(Atmospheric), Forests, Snow management, Snowfall, Watersheds(Basins).
Identifiers: Snow interception, Snow redistribution in forests, Fool Creek Watershed(Col), Fraser(Col).

Conventional methods for determining snow interception are similar to those used with rain. The difference between forest and open land is attributed to interception loss. The treatment of the Fool Creek watershed near Fraser, Colorado, gave an excellant opportunity to measure the effect of opening a uniform forest stand. Careful snow surveys were made for 11 years before cutting was done. The treatment was an alternate-strip clear-cutting that removed the trees from 39% of the 714-acre watershed. Both cut and leave strips were in widths of 1,2,3, and 6 tree heights with an average length of about 8 tree heights. Comparison of snow survey values before and after cutting showed that total snowpack on the watershed was not changed by the cutting. Because of the layout of these strips, the different strip widths are not independent, and comparisons of the effect of strip width are doubtful. Careful study of the processes involved in snow interception and transport is recommended before new snow interception studies are undertaken. There is a real need to reconsider the interpretation of earlier work in view of present knowledge of the pertinent physical processes. (See also W75-03023) (Humphreys-ISWS)
W75-04917

PERMAFROST HYDROLOGY.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada). 102 p, 2 append. J. Demers, editor.

Descriptors: *Permafrost, *Hydrology, *International hydrological decade, *Conferences, Environmental effects, Vegetation effects, Climates, Arctic, *Canada, *North America, Alaska, Hydrogeology, Groundwater, Hydrologic aspects, Streamflow, Runoff, Watersheds(Basins), Surface waters, Water, Movement, Energy budget, Specific heat, Geology, Rivers, Cold regions, Frozen ground, Hydrologic cycle.

The effects of permafrost on the various components of the hydrologic cycle were discussed at a workshop held at Calgary (Canada) in 1974. The subject areas discussed included: (1)environmental relationships, (2)hydrology, (3)geophysics, (4)runoff, (5))watersheds, (6)energy balance, (7)water movement, (8)specific heat, and (9)groundwater. (See W75-05139 thru W75-05150) (Humphreys-ISWS)
W75-05138

DISTRIBUTION AND ENVIRONMENTAL RELATIONSHIPS OF PERMAFROST,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
R. J. E. Brown.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 1-5. 3 ref.

Descriptors: *Permafrost, *Environmental effects, Vegetation effects, Hydrologic aspects, Topography, Climates, Forest fires, Soil types, Rocks, Glaciers, Cold regions, Frozen ground, Canada.

Permafrost was defined and its extent, thickness, and other characteristics such as ground ice and temperature regime were examined. The effects of climatic and terrain factors on permafrost, including relief, vegetation, hydrology, and snow cover were discussed. Special problems in permafrost regions, as well as past and present investigations were reviewed. Fluctuations have occurred through time in the extent, thickness, and temperature of the permafrost in response to changes in climate and terrain. Since its initial formation, the permafrost in any area may have dissipated and re-formed several times during periods of climatic warming and cooling. Glacial history has had a marked effect on permafrost. Changes in vegetation caused by fire, climatic succession, encroachment in water basins, or by the permafrost itself all have pronounced local effects. The regime of the fall and accumulation of snow influences the ground thermal regime, as does the geothermal gradient, which varies in different types of soil and rock, with changes in geological structure and with time. Thus, the environment in which permafrost exists constitutes a complex dynamic system, the product of past and present climate and terrain features, which are in turn influenced by the permafrost. The thermal sensitivity of permafrost is such that even small changes in climate and/or terrain will produce changes in the extent, thickness, and temperature of the permafrost. The interactions of permafrost with these factors in northern Canada are varied and very complex. Even a slight change in one factor produces a change in another or several others. (See also W75-05138) (Sims-ISWS)
W75-05139

HYDROLOGY AND PERMAFROST WITH REFERENCE TO NORTH AMERICA,
British Columbia Univ., Vancouver. Dept. of Geography.
M. Church.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 7-20. 5 fig, 4 tab, 57 ref.

Descriptors: *Permafrost, *Hydrology, *Water balance, *Surface waters, *Groundwater, Hydrologic cycle, Runoff, Lakes, Bogs, Muskeg, Seepage, Cold regions, *North America.

Summary information about the water balance in northern North America was presented and features of hydrology characteristic of northern regions were introduced. The terrestrial portion of the hydrologic cycle in country underlain by permafrost possesses several peculiarities that are qualified by ground thermal conditions. The chief contributions to runoff are from seasonal rainfall and snowmelt by direct surface flow, or by interflow through the active layer: permafrost restricts exchanges between surface water and deep groundwater. Four runoff regimes typical of northern rivers (subarctic nival, arctic nival, muskeg, proplacial) were illustrated. Permafrost presents an effectively impermeable stratum near the surface. However, it is perforated to a greater or lesser extent where it is discontinuous, where taliks occur, and below sufficiently large water bodies. These features mediate groundwater occurrence. Standing water in lakes and in muskeg may be retained by frost phenomena: some morphological features of northern lakes and bogs derive from this effect. Seasonal freezeback may trap water under pressure in unfrozen sediments, which may lead to 'icing.' (See also W75-05138) (Sims-ISWS)
W75-05140

GEOLOGY AND PERMAFROST IN RELATION TO HYDROLOGY AND GEOPHYSICS,
Geological Survey of Canada, Calgary(Alberta).
O. L. Hughes.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 21-28. 2 fig, 11 ref.

Descriptors: *Permafrost, *Hydrology, *Geology, *Geophysics, Ice, Frozen ground, Cold regions, Resistivity, Seismic studies, Glacial drift.

The complexity of the geologic framework within which the hydrologist and the geophysicist work is greatly enhanced in permafrost regions by the diversity of soil-water-ice conditions embraced by the term 'permafrost,' by the complex distribution of permafrost, and by the complex distribution of ground ice within the permafrost. The high costs of drilling in unsettled northern regions will necessitate heavy dependence on geophysical techniques in any regional inventories of geology, the distribution of permafrost and ground ice, and hydrology. Emphasis will be on light, portable, or airborne instrumentation. The selection of geophysical techniques and the design of instrumentation must be based on valid conceptual models of the distribution of geological materials, permafrost, and ground ice, and the models will vary greatly according to geological, climatic, and hydrologic history of the particular area concerned. Hydrologic studies in the permafrost regions of northern Canada are still in the preliminary stages. Integrated studies of the surface, active layer, and subpermafrost hydrologic regime have scarcely begun. Paleohydrology study of the changing hydrology regime during development of permafrost is an important key to understanding the distribution of permafrost and ground ice, but remains an underexploited field of research. (See also W75-05138) (Sims-ISWS)
W75-05141

RIVER HYDROLOGY IN PERMAFROST AREAS,
Manitoba Univ., Winnipeg. Dept. of Civil Engineering.
R. W. Newbury.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 31-37. 3 fig, 1 tab, 14 ref.

Descriptors: *Permafrost, *Hydrology, *Rivers, *Rainfall-runoff relationships, River flow, River basins, Watersheds(Basins), Arctic, Subarctic, Hydrologic cycle, Surface waters, Runoff, Streamflow, Cold regions.

An examination of permeable, relatively impermeable, and permafrost basins indicated that rainfall/runoff relationships are generally of the same order of magnitude and variability under all basin conditions. However, highest yields were observed in permafrost basins. Data dealing with bank stability, sediment transport, annual ice regime, and incidence of river icings are extremely limited in permafrost regions. The operation of a small number of index basins to investigate subsurface conditions, the development of standard river behavior surveys, and the establishment of a central agency for the compilation and exchange of hydrologic data from permafrost areas were recommended. In addition, the question of professional responsibility for the development of northern waters was raised. (See also W75-05138) (Sims-ISWS)
W75-05142

PERMAFROST-HYDROLOGY STUDIES AT BOOT CREEK AND PETER LAKE WATERSHEDS, N.W.T.,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
J. C. Anderson.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 39-44. 3 fig, 2 tab, 4 ref.

Descriptors: *Permafrost, *Hydrology, *Watersheds(Basins), Precipitation(Atmospheric), Runoff, Snowmelt, Cold regions, Storms, *Canada, Streamflow, Surface waters.
Identifiers: Northwest Territory.

Two small drainage basins on the east side of the Mackenzie Delta, Northwest Territory, are being studied as research watersheds. The basins lie within the continuous permafrost zone. Boot Creek basin drains an area of 31 sq km and flows into the East Channel of the Mackenzie Delta at the town of Inuvik. Peter Lake basin encompasses an area of 46 sq km to the north of Reindeer Station, and it drains northward via the Wolverine Lakes into the East Channel, below Tununuk. Some aspects of the precipitation and runoff regimes at these watersheds were noted. As data collection and analysis continue, a more complete understanding of the hydrology of these basins will be achieved. (See also W75-05138) (Sims-ISWS)
W75-05143

RUNOFF FROM A SMALL ARCTIC WATERSHED,
Water Survey of Canada, Halifax (Nova Scotia).
D. C. Ambler.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 45-49. 3 fig, 1 tab, 3 ref.

Descriptors: *Watersheds(Basins), *Arctic, *Hydrograph analysis, Hydrographs, Precipitation(Atmospheric), Runoff, On-site data collections, Weirs, Cold regions, Canada.
Identifiers: Ellesmere Island.

Hydrometric data collected from a small watershed on northern Ellesmere Island in 1973 were presented. Climatically, the area experiences long cold winters for nine to ten months each year with temperatures recorded at -30C or less. During the short summer period of approximately three months, daily temperatures may rise to only 10-15C. The mean annual precipitation amounts to about 140 mm with about 50% of this precipitation occurring as rain between June and September. In early June prior to the start of runoff, a control was constructed in the stream cross-section. A 120 degree V-notch weir was fabricated on site. From the runoff hydrograph, the greatest volume of runoff can be seen to occur within 10 days of the beginning of runoff. The peak has two high points, the second one corresponding to a rainfall event of June 24th. The 1973 runoff was equivalent to a yield of 4.63 inches over the basin. The short response time of the basin emphasizes the requirement for continuous measurement. The daily mean discharges presented, when analyzed on an hourly basis, illustrate a marked diurnal variation. The basin was oriented in relation to the sun path to produce peak daily flows between 2400 hours and 0230 hours and minimum daily flows between 1200 hours and 1600 hours. (See also W75-05138) (Sims-ISWS)
W75-05144

PERMAFROST HYDROLOGY: AN ALASKAN'S EXPERIENCE,
Alaska Univ., College. Inst. of Water Resources.
R. F. Carlson.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 51-57. 2 fig, 12 ref.

Descriptors: *Permafrost, *Hydrology, *Cold regions, *Streamflow, Runoff, Model studies, Floods, Snowmelt, Precipitation(Atmospheric), Bridges, Cold weather construction, Hydrologic cycle, Frozen ground, Rivers, Arctic, *Alaska.

Impending development in the north, particularly in permafrost regions, points to a need for a more extensive understanding of permafrost hydrology. Although the occurrence of permafrost itself is important to an understanding of hydrologic processes of northern regions, other important factors are low temperature, high latitude, large elevation differences, and an extremely sparse data network. When one is constructing models to understand the northern hydrologic systems, these factors must be kept in mind in conjunction with the particular problems of a region; whether they be of a mean value, extreme value, or time history nature. These considerations affect the understanding or modeling of each of the components of the hydrologic system: atmospheric, surface, soil, groundwater, and channel network. Major problems appear to deal with stream crossings of northern rivers, both in terms of flow magnitude and of water level, and of a more complete understanding of bottom mechanics. Another important need is for a more complete understanding of mass and energy transport in engineered and natural soils. Some examples of research on a particular phenomenon can be shown in the areas of sparse data flood design, the design of stream crossings in the vicinity of large overflow icings, and a more complete understanding of soil-water movement in frozen soils. Many features of the north must be kept in mind, certainly permafrost, but also other collaborative effects. But most importantly, the understanding of northern hydrologic problems must depend on input of a coordinated research development and design effort undertaken with the ultimate user in mind. (See also W75-05138) (Sims-ISWS)
W75-05145

PERMAFROST-RUNOFF: THE CONSULTING ENGINEER'S EXPERIENCE,
Bolter Parish Trimble Ltd., Edmonton (Alberta).
G. C. Seagel, and R. P. Parish.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 59-61. 1 ref.

Descriptors: *Permafrost, *Runoff, *Engineering, *Bridges, *Culverts, Hydrologic aspects, Peak discharge, Design criteria, Floods, Flow characteristics, Maximum probable flood, Arctic, Canada, Cold regions, Ice jams, Channel erosion.
Identifiers: Mackenzie Valley, North Slope.

The engineer is primarily interested in the consequences of permafrost as it affects the runoff regime of a given area. The effects may range from channel dynamics, through river behavioral components, to magnitude and rate of runoff contribution to the channel. The effect may influence the engineer's use of tools normally relied upon to evaluate the large variety of possible hydrologic components encountered at a crossing, thus adding another component for consideration. Observations of hydrology in permafrost regions, primarily in the Mackenzie Valley, as related to the engineering assessment for bridge and culvert crossings were outlined. Basic topics included: (1)effect of permafrost on magnitude and rate of runoff to the channel section-waterway opening requirements; (2)channel properties related to runoff in permafrost areas; (3)effects of extent of permafrost on the channel (with special reference to the north slope)-conceptual problems. The observations discussed were related to field and design work in northern Canada. (See also W75-05138) (Sims-ISWS)
W75-05146

ENERGY BALANCE CONSIDERATIONS IN PERMAFROST HYDROLOGY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
G. P. Williams.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 63-67. 2 tab, 16 ref.

Descriptors: *Permafrost, *Energy budget, *Hydrology, *Water supply, Energy transfer, Heat balance, Heat flow, Solar radiation, Evaporation, Evapotranspiration, Snow cover, Snowmelt, Runoff, Energy loss.
Identifiers: Surface cover.

Surface heat exchange processes affect movement and supply of water in permafrost regions. Several hydrological problem areas were discussed from an energy balance point of view. These included: snow cover and snow melt, evaporation and evapotranspiration losses, and the hydrological significance of surface features (thermokarst, icings, etc.), which are partly determined by energy exchange processes. An overview was given of the general subject matter. (See also W75-05138) (Sims-ISWS)
W75-05147

DYNAMICS OF WATER MOVEMENT IN PERMAFROST: A REVIEW,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
R. L. Harlan.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 69-77. 5 fig, 29 ref.

Descriptors: *Permafrost, *Groundwater movement, *Hydrodynamics, *Fluid mechanics, Heat flow, Soil temperature, Soil moisture, Groundwater, Subsurface waters, Flow, Solutes, Salts, Thermodynamics, Water vapor, Frozen ground, Cold regions, Physical properties, Physicochemical properties, *Reviews.

Coupled heat-fluid transport processes in porous earth materials that are subject to freezing and thawing are highly complex and at present imperfectly understood. As a consequence, in most engineering and hydrologic studies permafrost is regarded as an impermeable barrier to all water movement. The theoretical and experimental evidence suggesting the mobility of water in

frozen earth materials and the various heat and mass transport mechanisms operative above, within, and below the permafrost zone was examined from a hydrodynamic point of view. The effects of seasonal and long-term temperature changes on the surface and basal configurations of the permafrost layer and on the groundwater flow regime were also discussed. In particular the effects of convective heat transport associated with groundwater flow and water migration within the permafrost zone itself were examined. (See also W75-05138) (Sims-ISWS)
W75-05148

SPECIFIC HEATS OF COMPONENTS OF FROZEN SOIL,
Guelph Univ., (Ontario). Dept. of Land Resource Science.
B. D. Kay.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 79-82. 2 fig, 9 ref.

Descriptors: *Permafrost, *Frozen soils, *Specific heat, Water, Movement, Ice, Organic matter, Clays, Soil temperature, Groundwater.

Water movement in frozen terrain is controlled, in part, by the thermal characteristics of the materials that are present. The coupling between mass and heat transport arises because hydraulic potentials and hydraulic conductivity of frozen soil materials are particularly temperature dependent. Predictions of the rates of water and heat movement by computer-based models subsequently require predictions of the thermal properties (heat capacity and thermal conductivity) of the frozen terrain. The assumption that the specific heats of components of frozen soil do not vary with temperature is not valid; however, the assumption introduces substantial error only at low temperatures where there is a negligible amount of unfrozen water. The use of linear temperature functions could eliminate this error. (See also W75-05138) (Sims-ISWS)
W75-05149

GROUNDWATER IN PERMAFROST REGIONS OF CANADA,
Department of the Environment, Calgary (Alberta). Water Resources Branch.
R. O. van Everdingen.
In: Permafrost Hydrology; Proceedings of Workshop Seminar, 1974, Calgary, Alberta (Canada), February 26-28, 1974. Environment Canada, Ottawa (Canada), p 83-93. 1 fig, 4 tab, 13 ref.

Descriptors: *Permafrost, *Groundwater, *Water supply, *Water chemistry, *Water analysis, Water supply development, Groundwater movement, Groundwater resources, Ice jams, Aquifers, Dissolved solids, Spring waters, Hot springs, Thermal springs, Discharge(Water), Cold regions, Hydrogeology, Engineering, *Canada.

Evidence of groundwater flow systems is found in Canada's permafrost regions in the form of springs (thermal, non-thermal, mineral, and non-mineral), associated icings or aufeis, open-water reaches in rivers in winter, contributions to baseflow and to dissolved mineral content of streams, and concentrations of halophytic vegetation. Little use is made of groundwater for either domestic or industrial supply in northern Canada at present, and its potential in this respect has hardly been explored. Reliable supplies are available in a number of areas from unconsolidated gravels or sands, or from sandstones, carbonates, or fractured crystalline rocks where these are not frozen. Water obtained from the active layer usually has an appreciable organic content; water from unfrozen karst systems, in or near the mountains, and from unfrozen gravels often is of good quality; deeper groundwater may range in quality from fresh to salt. Apart from its water-supply potential, groundwater has an essential role in enabling fish populations to survive in northern streams; as well, groundwater discharge areas are often a source of trouble in construction and maintenance of engineering projects. Quick conditions, frost heaving, slope failures, active formation of ice lenses, and buildup of aufeis may all occur naturally, or they may be induced through changes in groundwater flow patterns caused by engineering development. The water-supply, engineering, and fisheries aspects of groundwater in the permafrost region all need further study, not only in terms of inventory, but also to gain a better understanding of the interaction between groundwater systems and engineering developments. (See also W75-05138) (Sims-ISWS)
W75-05150

CONTINUOUS RANDOM NETWORK MODEL FOR AMORPHOUS SOLID WATER,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Magnetisme.
For primary bibliographic entry see Field 1B.
W75-05161

AMORPHOUS SOLID WATER: A NEUTRON DIFFRACTION STUDY,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 1B.
W75-05169

MICROWAVE MAPS OF THE POLAR ICE OF THE EARTH,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
P. Gloersen, T. T. Wilheit, T. C. Chang, and W. Nordberg.
Bulletin of the American Meteorological Society, Vol 55, No 12, p 1442-1448, December 1974. 8 fig, 13 ref.

Descriptors: *Remote sensing, Microwaves, *Ice cover, *Ice-water interfaces, Ice, Arctic, Antarctic, Satellites(Artificial), Data collections, Maps, Mapping.
Identifiers: Pack ice, Continental ice, Ice morphology, Greenland, *Microwave maps.

Synoptic views of the entire polar regions of Earth were obtained free of the usual persistent cloud cover by using a scanning microwave radiometer operating at a wavelength of 1.55 cm on board the Nimbus-5 satellite. Three different views at each pole were presented utilizing data obtained at approximately one-month intervals during December 1972 to February 1973. The major discoveries resulting from an analysis of these data were as follows: (1) Large discrepancies exist between the long-term ice cover depicted in various atlases and the actual extent of the canopies. (2) The distribution of multiyear ice in the north polar region is markedly different from that predicted by existing ice dynamics models. (3) Irregularities in the edge of the Antarctic sea ice pack occur that have neither been observed previously nor anticipated. (4) The brightness temperatures of the Greenland and Antarctic glaciers show interesting contours probably related to the ice and snow morphologic structure. (Sims-ISWS)
W75-05170

2D. Evaporation and Transpiration

A WATER BALANCE RECORDER FOR HYDROCLIMATIC AND AGROCLIMATIC MEASUREMENT OF PRECIPITATION AND EVAPORATION,
O. Klausing.
In: Plant Response to Climatic Factors, Proceedings of The Uppsala Symposium, 1970, Uppsala, Sweden, United Nations Educational, Scientific and Cultural Organization, Paris, p 489-495, 1973. 5 fig, 3 tab, 6 ref.

Descriptors: *Water balance, *Soil-water-plant relationships, Precipitation Gages, Soils, Water, Rainfall, *Evaporation, Agroclimatology, Meteorological data, Measurement, Precipitation(Atmospheric).
Identifiers: *Filter disc, *Piche filter disc, Sensors, Psychrometer, Evaporation gage, Recorders.

A continuously recording field water balance instrument, sensitive to both rainfall and evaporation, was described. The rainfall sensor consists of a funnel leading to a collector where water level changes are transmitted to a chart by a float-activited pen. The evaporation element consists of a 5 cm Piche filter disc wetted on both sides so that it vaporizes water piped from the rainfall container. The recorder chart can show a positive water balance denoting a rainfall preponderance or a negative water balance when evaporation predominates. Two recording curves demonstrated contrasting negative and positive types of hydroclimatic water balance obtained during the 1969 summer. Data were collected from the southern part of Germany and, under tropical conditions, at El Salvador. The instrument indicated the water balance under conditions of rainfall and maximum potential evaporation. The agro-climatic value of such data is to supply information about water conditions for plant cover and soil. Also, comparison of recording curves from different stands may show differences in hydroclimatic conditions of life for cultivated plants. (Roberts-ISWS)
W75-04914

RELATIVE SIGNIFICANCE OF SOIL AND PLANT EVAPORATION IN ESTIMATING EVPOTRANSPIRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra(Australia). Div. of Plant Industry.
O. T. Denmead.
In: Plant Response to Climatic Factors, Proceedings of The Uppsala Symposium, September 15-20, 1970, Uppsala, Sweden. United Nations Educational, Scientific and Cultural Organization, Paris, p 505-511, 1973. 7 fig, 15 ref.

Descriptors: *Evapotranspiration, *Evaporation, Soils, Soil temperature, Vegetation, Canopy, Energy transfer, Soil surfaces, Soil physics, Soil investigations, Soil density, Soil moisture.
Identifiers: *Soil evaporation, *Plant evaporation, Foliage, Evaporation rate, Flux density.

The determination of the soil surface temperature from relatively simple observations of the weather above plant stands, and knowledge of the structure of the canopy and the moisture and thermal properties of the soil was discussed. An examination of the effects of surface temperature on energy exchange at the soil surface, on the canopy microclimate, and on the consequent exchanges of heat and water vapor at foliage surfaces follows. It was shown that the two components, soil evaporation and transpiration, can be regarded as virtually independent and therefore additive. The reported research was an attempt to quantify a complete crop cover. Comparison was made with work done by Penman, and was close for evapotranspiration when the soil was wet. When the surface was dry, evapotranspiration from common agricultural crops was as much as 60% less. Soil moisture states intermediate between the wet and dry were not accounted for. No predictions were made on the distribution of leaf resistances in the canopy, noting that the complete model of evapotranspiration is complicated. (Roberts-ISWS)
W75-04915

FACTORS AFFECTING POTENTIAL EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Water Science and Engineering.

W. O. Pruitt.
In: Biological Effects In The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 82-102. 10 fig, 34 ref.

Descriptors: *Evapotranspiration, *Solar radiation, *Vegetation effects, Energy budget, Climatology, Hydrolocic cycle, Air temperature, Winds, Humidity, Diurnal distribution, Spring, Summer, Autumn, Soil temperature.
Identifiers: *Potential evapotranspiration, *McIlroy equation, Energy balance, Radiation balance.

Basic factors affecting potential evapotranspiration were considered. Radiation balance was discussed briefly. Considerable attention was given to the energy balance and the effect of various climatic factors on the portioning of net radiation into latent and sensible heat fluxes. Evapotranspiration studies where for the most part, full cover, vegetative surfaces with low stomatal characteristics were involved showed heat losses to the soil from mid-March until mid-September, with heat gained from the soil during the other months. The McIlroy energy balance-aerodynamic equation illustrated the reasons there can be no simple answer to a question like 'What is the effect on evapotranspiration of doubling the wind speed.' The evaporation process is a highly complicated process with many interrelated factors. Wind may quite drastically affect evapotranspiration percentagewise under dry, low-radiation conditions, while under high-radiation, high-humidity conditions the effect of wind may be considerably less important. Under calm conditions with a given amount of radiation, the effect of humidity levels may be relatively unimportant, especially with high radiation levels. The importance of temperature differences of even 10-15 F should be relatively unimportant under calm humid conditions but would be very significant under dry windy conditions. (See also W75-03023) (Humphreys-ISWS)
W75-04916

2E. Streamflow and Runoff

A REVIEW OF FISHERIES MINIMUM FLOW METHODOLOGIES FROM THE VIEWPOINT OF WATER AVAILABILITY,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 3B.
W75-04861

STREAM PROGRAMMER'S MANUAL.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W75-04874

FLOOD FREQUENCY AND RISK,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4A.
W75-04876

HYDROLOGIC FORECASTING IN THE WATER RESOURCES BRANCH,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W75-04881

MECHANICS OF SURFACE RUNOFF ON HILLSLOPES,
Agricultural Research Service, Athens, Ga. Soil and Water Conservation Research Div.
D. E. Overton.
In: Biological Effects in the Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 186-210. 9 fig, 2 tab, 13 ref.

Descriptors: *Surface runoff, *Overland flow, *Rainfall-runoff relationships, *Agricultural runoff, Runoff, Surface drainage, Sheet flow, Rain water, Hydrology, Running waters, Drainage water, Shallow water, Urban runoff, Storm runoff, Storm water, Slopes, Sediment transport, Analytical techniques.
Identifiers: *Kinematic wave equations, Hillslopes, Hills, Mechanics, Rills.

Mechanics of overland flow on hillslopes was examined by use of kinematic wave equations. In applying these equations to overland flow on hillslopes, it was concluded that the transition of viscous flow to turbulent flow was indeterminent. The results from computing equilibrium depth profiles on hillslopes for a purely viscous and a purely turbulent flow with uniform roughness were (1) the velocity and boundary shear stress distribution along the hills were influenced considerably by curvature of the symmetrical hillslopes studied, while (2) equilibrium storage and hydrologic response time were influenced very little by hillslope curvature. No simple all-inclusive relation between the hillslope hydraulics parameters and the overland flow was found. The results from this study showed clearly that the curvature of a hillslope influences the velocity, depth and boundary shear distributions of the hill, but not the total water stored or the hydrologic response time. However, in turbulent flow, the roughness distribution of the hill significantly increased or decreased water storage and response time relative to a plane. (See also W75-03023) (Roberts-ISWS)
W75-04921

EFFECT OF VEGETATION ON STORM HYDROGRAPHS,
Agricultural Research Service, Coshocton, Ohio. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 4C.
W75-04926

DEVELOPMENT OF A TWO-CHANNEL LINEAR DISCRIMINANT FUNCTION FOR DETECTING AND IDENTIFYING SURFACE WATER USING ERTS-1 DATA.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05103

EVALUATION OF COMPUTER-AIDED PROCEDURE FOR DETECTING SURFACE WATER.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05104

TO DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES,
Maine Dept. of Transportation, Augusta. Bureau of Highways.
For primary bibliographic entry see Field 4A.
W75-05130

HYDROLOGICAL BASIS FOR FORECASTING AND CALCULATING RUNOFF BY SPACE IMAGES OF THE EARTH'S SURFACE,
Kanner (Leo), Associates, Redwood City, Calif.
For primary bibliographic entry see Field 4A.
W75-05135

DISCHARGE OF SELECTED RIVERS OF CANADA.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
Information Canada, Ottawa, 1972. 338 p, 3 fig, 1 append.

Descriptors: *Data collections, *International Hydrological Decade, *Canada, *Stream-flow, Basin data collections, Gaging stations, Rivers, Discharge(Water), Surface waters, Hydrologic data, Drainage area, Watersheds(Basins), Sites, Altitude, Peak discharge, Annual, Monthly, Average.
Identifiers: Maximum mean daily discharge, Latitude, Longitude, Minimum mean daily discharge.

Yearly discharge data up to 1970 for each of 72 Decade stations were duplicated in two sections. The metric system of units was used in the first section and the English system of units in the second section. Data for each station comprised 3 parts: (1) basic station data, including the station index number (the GEOREP index system was used in the metric unit portion of the report whereas the index system followed the Canadian data collection agencies was used in the English unit portion. An explanation of the GEOREP system is given in an appendix), the river and station name, the drainage basin, the latitude and longitude of the station, the altitude above MSL, and the drainage area; (2) the yearly discharge data, including the monthly, yearly, maximum mean daily, minimum mean daily, and maximum instantaneous discharges where available; and (3) the long term average monthly and yearly discharge data. The discharges in both sections were tabulated to three significant figures. (See also W75-05137) (Humphreys-ISWS)
W75-05136

DISCHARGE OF SELECTED RIVERS OF CANADA, SUPPLEMENT 1.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
Information Canada, Ottawa, 1974. 23 p.

Descriptors: *Data collections, *International Hydrological Decade, *Canada, *Streamflow, Basic data collections, Gaging stations, Rivers, Discharge(Water), Surface waters, Hydrologic data, Drainage area, Watersheds(Basins), Sites, Altitude, Peak discharge, Annual, Monthly, Average.
Identifiers: *Canadian National Committee, Maximum mean daily discharge, Minimum mean daily discharge, Latitude, Longitude.

In 1972 the Canadian National Committee of the International Hydrological Decade published 'Discharge of selected rivers of Canada,' a collection of data on 72 river discharge stations given in the metric and North American systems of units. The 1972 publication reported basic station data, yearly discharge data, and long term average monthly and yearly discharge data up to 1970 for the 72 stations, giving continuous year records, in some instances, of more than 100 years. Supplement 1 provides discharge data for 1971 and 1972. It introduces one new station into the records, which replaces a station that was abandoned in 1972. (See also W75-05136) (Humphreys-ISWS)
W75-05137

HYDROLOGY AND PERMAFROST WITH REFERENCE TO NORTH AMERICA,
British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-05140

RIVER HYDROLOGY IN PERMAFROST AREAS,
Manitoba Univ., Winnipeg. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2C.
W75-05142

PERMAFROST HYDROLOGY: AN ALASKAN'S EXPERIENCE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2C.
W75-05145

PERMAFROST-RUNOFF: THE CONSULTING ENGINEER'S EXPERIENCE,
Bolter Parish Trimble Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 2C.
W75-05146

SOFAR CHANNEL AXIAL SOUND SPEED AND DEPTH IN THE ATLANTIC OCEAN,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 8B.
W75-05156

CONTINUOUS HYDROLOGICAL TIME-SERIES DISCRETIZATION,
Technical Univ. of Lisbon (Portugal). Instituto Superior Tecnico.
For primary bibliographic entry see Field 2A.
W75-05165

RAINFALL TEMPORAL PATTERNS FOR DESIGN FLOODS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-05166

INTERNAL GRAVITY WAVES IN A SLOWLY VARYING, DISSAPATIVE MEDIUM,
Melbourne Univ., Parkville (Australia).
R. Grimshaw.
Geophysical Fluid Dynamics, Vol 6, No 2, 131-148, 1974. 7 ref.

Descriptors: *Gravity waves, *Compressible flow, *Viscosity, Water circulation, *Internal waves, Momentum equation, Energy equation, Continuity equation, Mathematical studies, Frequency.
Identifiers: *Transport equations, Two-timing technique, Dissipative medium.

Fluid transport equations were derived for the propagation of internal gravity waves in a nonuniform, slightly compressible fluid containing a small amount of dissipation. Because of the presence of the dissipative terms, an averaged Lagrangian could not be used. The field variables were assumed to possess a two-time-scale structure in both the time and space variables. The transport equations were then formulated with the requirement that the two-time-scale structure be well ordered (In this case, periodic in the phase), at least on the time and length scales associated with the basic stratification and mean flow. The transport equations described the changes in amplitude, phase, and mean flow of a wave packet. Various solutions of these transport equations were discussed, with relevance to critical layer absorption. (Singh-ISWS)
W75-05188

FLOW RESISTANCE IN SAND BED CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05220

FLOW AND RESISTANCE CHARACTERISTICS OF SAND BED CHANNELS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W75-05221

THE HISTORY OF SEDIMENT YIELD AND DEPOSITION OF THE JUBONES RIVER, ECUADOR, AND ITS RELATION TO ENGINEERING PROJECTS,
For primary bibliographic entry see Field 2J.
W75-05257

FLOOD FLOW FREQUENCY TECHNIQUES,
Texas Univ. at Austin. Center for Research in Water Resources.
L. R. Beard.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 951, $7.25 in paper copy, $2.25 in microfiche. Technical Report CRWR-119, October 1, 1974. 216 p, 4 fig, 22 tab, 92 ref, 6 append. OWRT C-5340(No. 9088)(1).

Descriptors: *Flood frequency, *Flood forecasting, *Statistical methods, *Frequency analysis, *Statistical models, *Stochastic processes, *Regression analysis, Stochastic hydrology, Flood flow, Maximum probable flood, Historic floods, Streamflow forecasting, Streamflow, Runoff, Frequency distribution, Runoff forecasting.
Identifiers: Log Pearson III with regional skew, Log Pearson III, Log Normal, Gumbel, Log Gumbel, 2-Parameter Gamma, 3-Parameter Gamma, Best Linear Invariant Estimates, Computer analysis, Outlier techniques, Zero flows, Split-record testing, Partial duration.

Through the use of computer analysis, techniques were developed that will yield greater reliability and consistency than has heretofore been available in flood flow frequency determinations from data on natural streamflows available at the location for which each frequency estimate is to be computed. 300 U.S. Geological Survey streamflow stations with records 40 years or longer and unregulated flow were selected and analyzed using Log Pearson III, Log Normal, Gumbel, Log Gumbel, Two-Parameter Gamma, Three-Parameter Gamma, Log Pearson III with regional skew and Best Linear Invariant Gumbel distribution techniques. Zero-flow and outlier techniques were also considered. The results indicate the Log Pearson III method with regional skew coefficients will produce unbiased estimates when the adjustments to expected probability is employed and will reduce uncertainty as much or more than the other methods tested. (Smith-Texas)
W75-05262

GTWS: GEORGIA TECH WATERSHED SIMULATION MODEL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-05271

2F. Groundwater

DIGITAL SIMULATION OF HORIZONTAL SALT-WATER ENCROACHMENT INDUCED BY FRESH-WATER PUMPING,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2L.
W75-04875

THREE-DIMENSIONAL SUBSURFACE DELINEATION VIA A NOVEL METHOD FOR DETERMINING THE SUBSURFACE ELECTRICAL PROFILE,
California Univ., Livermore. Lawrence Livermore Lab.
R. J. Lytle, R. M. Bevensee, and D. L. Lager.
Available from the National Technical Information Service, Springfield, Va 22161 as UCRL-51685, $4.00 in paper copy, $2.25 in microfiche. Report No. UCRL-51685, 1974. 17 p, 8 fig, 15 ref. AEC Contract No. W-7405-ENG-48.

Descriptors: *Resistivity, *Subsurface investigations, *Stratistical methods, Geophysics, Conductivity, Laplaces equation, Homogeneity, Analytical techniques.
Identifiers: *Probabilistic potential theory, Subsurface anomalies.

The combination of a standard experimental procedure (four-probe electrical resistivity), a novel analytical technique (probabilistic potential theory), and a powerful inversion algorithm (optimization/generalized linear inverse) was proposed as a method for determining the subsurface electrical profile. Four-probe electrical measurements can yield electrical profiles which, in the light of known geologic information about the site, can be related directly to subsurface structure. However, the reduction of field data from such measurements heretofore has generally been successful only for the mathematically nice situations (e.g., horizontal or vertical stratification). For the more complicated case of general subsurface structure, the presently available analytical methods rapidly become unwidely, computer-limited, or cost-ineffective. The proposed analytical procedure should overcome these limitations and permit the efficient solution of complicated problems of subsurface structure. It was proposed that the feasibility of the procedure be tested by analysis of field experiments in conjunction with scale-model laboratory experiments to validate the algorithms for general structure. The procedure should have great practical value in a wide variety of applications: hydrology, location and definition of the shape and extent of underground resources, faultline definition, and monitoring of changes in subsurface conditions. (Schicht-ISWS)
W75-05116

GEOHYDROLOGIC RELATIONSHIPS IN WATER POLLUTION,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W75-05128

PERMAFROST HYDROLOGY.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2C.
W75-05138

HYDROLOGY AND PERMAFROST WITH REFERENCE TO NORTH AMERICA,
British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-05140

DYNAMICS OF WATER MOVEMENT IN PERMAFROST: A REVIEW,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W75-05148

GROUNDWATER IN PERMAFROST REGIONS OF CANADA,
Department of the Environment, Calgary (Alberta). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W75-05150

HYDROGEOLOGY OF THE LETHBRIDGE-FERNIE AREA, ALBERTA,
Alberta Research, Edmonton.
O. Tokarsky.
Report 74-1, p 18, 1974. 45 ref.

Descriptors: *Hydrogeology, *Geologic control, *Geochemistry, Alluvial aquifers, Detritus, Faults(Geologic), Groundwater, Dissolved solids, Groundwater movement, Water yield, Permeability, Potentiometric level, Topography, Springs, Bicarbonates, Sulfates, Canada.
Identifiers: *Alberta, Buried river valleys, Well yields.

Clastic rocks, largely non-marine, of Upper Cretaceous age and some of Tertiary age underlie the plains in the Lethbridge-Fernie map area. The regional dip is westward, ranging from 20 to 200 feet per mile. Closely spaced, high-angle thrust faulting has deformed the Upper and Lower Cretaceous clastics of the foothills belt. Mesozoic clastics, Paleozoic carbonates, and Precambrian clastic and carbonate rocks in the mountain areas have been affected by low- to moderate-angle thrusting. The interpretation of the hydrogeology has certain limitations due to the low reliability of data over large areas, thus yield values were based on a number of assumptions related to geology and topography. The highest expected well yields are to be found in present-day alluvial gravels and in sands and gravels of buried river valleys. Bedrock formations are expected to give generally very low to moderate yields, although there are some major exceptions. Groundwater of over 1000 ppm in total dissolved solids of either sodium sulfate or mixed cation sulfate-bicarbonate type is common over much of the plains part of the area, while better quality potable water of the calcium-magnesium bicarbonate type predominates in the foothills and mountain areas. (Visocky-ISWS)
W75-05151

REGIONAL CHEMISTRY AND WATER LEVEL DISTRIBUTION OF THE NEAR-SURFACE GROUNDWATERS OF THE EDMONTON AREA (NORTHWEST SEGMENT), ALBERTA,
Alberta Research, Edmonton.
R. Bibby.
Report 74-6, p 76, 1974. 51 fig, 8 ref.

Descriptors: *Hydrogeology, *Geochemistry, *Water levels, *Groundwater, Alluvial aquifers, Geologic control, Bedrock, Water chemistry, Maps, Permeability, Infiltration, Ion exchange, Potentiometric level, Topography, Soils, Dissolved solids, Groundwater movement, Chemistry, Chemical reactions, *Canada.
Identifiers: *Alberta(Canada), Buried river valleys, Regional studies.

The chemistry and water level distribution of the near-surface groundwaters were described and interpreted on a regional basis. To facilitate description and interpretation the available basic data were sorted into three groups. These groups were data from the drift, data from the upper 75 feet of bedrock, and data from the bedrock from 75 to 250 feet. The data for each of these layers were then automatically contoured. These contour maps of chemistry and water levels for each layer were presented. Interpretation of the contoured data led to the following major conclusions: the water level distribution closely resembles surface topography; over most of the area flow has a downward component relative to the water table; buried channel sands and gravels act as high permeability linesinks and are a major influence on water level distribution; soils and drift lithology are the major influence on groundwater chemistry, flow direction is a minor influence; Stony Plain and Gladu Peak are major areas of infiltration to groundwater; ion exchange occurs from the drift to bedrock quickly and completely; and some sulfate reduction takes place from drift to bedrock. (Visocky-ISWS)
W75-05152

HYDROGEOCHEMISTRY OF CARBONATE GROUNDWATERS OF AN URBAN AREA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
D. T. Long, and Z. A. Saleem.
Water Resources Research, Vol 10, No 6, p 1229-1238, December 1974. 4 fig, 5 tab, 29 ref.

Descriptors: *Geochemistry, *Hydrogeology, *Dolomite, *Urban hydrology, Geologic control, Saturation, Supersaturation, Groundwater, Equilibrium, Carbon dioxide, Glacial drift, River basins, Aquifers, Water table, Groundwater movement, Illinois, Carbonates.
Identifiers: *Northeastern Illinois Metropolitan Area (NIMA), *Salt Creek(Ill), Cook County(Ill), DuPage County(Ill), Ion pairing.

A comparison of the groundwater chemical data from the shallow dolomite aquifer of North-eastern Illinois Metropolitan Area (NIMA) from August 1972 through April 1973 with data collected 12-40 years earlier indicated that concentrations of all ions have increased, the greatest increase occurring in the southeastern part of the area where the overburden is thinnest. The largest increases are 843, 142, and 91% in Cl(-), SO4(2-), and Na(+), respectively. However, the spatial distribution of the groundwater chemical types has remained the same with time. The groundwater was apparently supersaturated with respect to calcite and dolomite; however, the two saturation indices were reduced by 20 and 30%, respectively, after considering the effect of ion pairings. The chemical character of the groundwater is controlled, among other factors, by the change of the carbon dioxide content of the water along the groundwater flow path. A model for the solution of dolomite based on the standard equations for carbonate equilibrium was presented. The application of the model to the study area indicates that a variety of geologic conditions between the dolomite aquifer and the overlying glacial drift prevail in the area. (Visocky-ISWS)
W75-05163

THE GEOLOGY AND HYDROGEOLOGY OF THE NEW LEAD BELG, MISSOURI,
Missouri Univ., Rolla. Dept. of Geological Engineering.
C. S. Fletcher.
Available from the National Technical Information Serivce, Springfield Va. 22161, as PB-239 613, $4.75 in paper copy, $2.25 in microfiche. Ms Thesis, 1974. 83 p, 2 fig, 2 tab, 27 ref. OWRR A-060-MO (1).

Descriptors: *Mine water, *Groundwater resources, Geologic formations, Geologic mapping, Hydrogeology, Potentiometric level, Groundwater, Pumping, Drillers logs, Lithologic logs, Water wells, Aquifers, Aquicludes, Facies(Sedimentary), Leakage, *Missouri.
Identifiers: *New Lead Belt area(Mo), Lead mines, Davis formation, Clastic-to-carbonate ratio.

In order to analyze the effects of pumping groundwater from underground lead mines upon present groundwater resources of the New Lead Belt area, the geology and hydrogeology of that area must first be determined. This analysis was achieved through interpretation of geologic and hydrogeologic data taken from water well logs and mineral exploration well logs, supplemented by the literature. From all these sources of data, structural contour maps, isopachous maps, a generalized clastic-to-carbonate ratio map, and a shallow aquifer potentiometric surface map were constructed. The surface map, when compared to the structural contour maps, illustrates tha the regional hydrogeologic gradient within the Black River basin is at an oblique angle to the regional geologic gradient. Three hydrogeologic groups were established to qualitatively evaluate the recharge of groundwater into mines: the shallow aquifer, the Davis Formation, and the deep aquifer. Three primary methods of recharge to the deep aquifer are: vertical leakage through the Davis Formation 'leaky aquiclude facies' which include both intergranular leakage and leakage through faults and fractures; migration of groundwater from the deep aquifer outcrop area; and migration of groundwater down the shallow aquifer gradient to the Davis Formation 'aquifer facies.' (Visocky-ISWS)
W75-05175

AQUATHERMAL FLUID MIGRATION,
Imperial Oil Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 4B.
W75-05182

SEDIMENT TRANSPORT THROUGH A POROUS COLUMN,
Madras Univ., Guindy (India). Coll. of Engineering.
For primary bibliographic entry see Field 2J.
W75-05231

INVESTIGATION OF ALTERNATIVE PROCEDURES FOR ESTIMATING GROUNDWATER PARAMETERS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 4B.
W75-05263

FLOW PATTERNS OF STEADY RAINFALL SEEPING THROUGH BEDDED LAND OR A HILLSIDE WITH A BARRIER AT GREAT DEPTH,
Virginia Polytechnic/Inst. and State Univ., Blacksburg. Dept. of Agronomy.
N. L. Powell, and D. Kirkham.
Journal of Hydrology, Vol 23, No 3/4, p 203-217, 1974. 6 fig, 2 tab, 11 ref. OWRT A-044-IA(2).

Descriptors: *Flow nets, *Groundwater movement, *Recharge, *Rainfall, *Boundaries(Surfaces), Beds, Infiltration, Laplaces equation, Percolation, *Seepage, Soil water movement, Potential flow, Natural recharge, Aquifers, Equations, Mathematical studies, Flow rates, Steady flow, *Surface-groundwater relationships.
Identifiers: Hillside recharge, Flow patterns, Impermeable barriers.

The problem of the steady seepage of rainfall or other recharge through bedded fields underlain by an impermeable barrier at a great depth was solved for finite depths of water in the bedding furrows. The problem solution applies to soil bedding, hillside seepage as a river, and closely spaced furrows and ridges as in row cropping. Two basic geometries were considered: a rectilinear bedding and an elliptic bedding for homogeneous soil. The rainfall rate needed to keep the bedding saturated, the average quantity per unit area per unit time of water flowing through the soil, and the ratio between the two were calculated. By changing the shape of the soil surface from rectilinear to elliptic, the ratio for the geometries increased about 400%. Flow nets for several soil-bedding geometries were presented and it was seen that water enters the soil upslope above a critical point and, after flowing through the soil, resurfaces again downslope and enters surface runoff. The critical point was located farther downslope for a finite depth of barrier than for an infinite depth. This in-and-out seepage of water illustrated how soluble material may be removed from the soil and added to surface runoff. The flow nets also showed how seepage spots on a hillside may develop and how a type of base flow may occur. When rain or other applied recharge ceases, the soil water itself may be considered to supply the recharge in quasi-steady flow for a limited time. This quasi-steady recharge drains downward over a larger percentage of the surface area of elliptic bedding than of rectilinear and thus indicated that elliptic is better than rectilinear for removal of soil water. (Prickett-ISWS)
W75-05339

2G. Water In Soils

RELATIVE SIGNIFICANCE OF SOIL AND PLANT EVAPORATION IN ESTIMATING EVPOTRANSPIRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra(Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2D.
W75-04915

INFILTRATION OF WATER INTO THE SOIL PROFILE,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
R. W. Skaggs.
In: Biological Effects in The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 123-135. 5 fig, 47 ref.

Descriptors: *Soil water movement, *Infiltration, *Soil physical properties, Unsaturated flow, Saturated flow, Diffusion, Hydrualic conductivity, Porous media, Hysteresis.
Identifiers: Buckingham-Darcy equation, Richards equation.

The equations governing the movement of water into and through the soil profile were presented and numerical techniques for their solutions were cited. Solutions to the Richards equation for various boundary and initial conditions were used as a basis for discussion of the effects of initial water content, depth of surface ponding, rainfall application rate, surface sealing and stratified soil profiles on vertical infiltration. The sensitivity of solutions of Richards equation to errors made in measuring the hydraulic properties of soil was also discussed. Difficulties in applying soil-water movement theory to field conditions were described. (See also W75-03023) (Schict-ISWS)
W75-04918

INFILTRATION ROLE OF LARGE SOIL PORES: A CHANNEL SYSTEM CONCEPT,
Nevada Agricultural Experiment Station, Reno.
R. M. Dixon.
In: Biological Effects in The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 136-147. 4 fig, 11 ref.

Descriptors: *Infiltration, *Soil physical properties, *Soil water movement, *Soil structure, *Soil management, *Soil surfaces, *Pores, Soil water, Capillary water, Soil bacteria, Cultivation, Soil compaction, Hydraulic conductivity.
Identifiers: *Channel system concept, *Soil pores, *Soil surface roughness, Soil tillage practices, Physical models.

The infiltration role of large soil pores was detailed by the channel system concept. Seven points describing this concept were summarized. The channel system concept embodies six physical representing two degrees of surface roughness and three degrees of channel openness. These models can guide practical application of the concept since they represent naturally occurring soil surface conditions that can be readily identified and easily created in the field. Further research is needed to adapt existing mathematical models to the channel system concept. (See also W75-03023) (Schict-ISWS)
W75-04919

A FORMULATION FOR QUANTIFYING THE INFLUENCE OF SOIL POROSITY AND VEGETATION ON INFILTRATION,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
H. N. Holtan.
In: Biological Effects In The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 228-239. 10 fig, 2 tab, 6 ref.

Descriptors: *Soils, *Infiltration, *Infiltrometers, *Soil physical properties, *Soil physics, Soil texture, Soil structure, Pores, Land use, Permeability, Porosity, Saturated flow.
Identifiers: *Sprinkler infiltrometer data, *Infiltration equation, Crop water consumption, Land cover, Vegetative density, Capillary flow system, Channel flow system.

An infiltration equation was derived empirically from sprinkler infiltrometer data and parameters were empirically related to dimensions of soil and vegetation. The derived relationships appear rational through comparison with laboratory tests of applied soil physics by various researchers. The advantages of the exhaustion equation presented lie mainly in the availability of input data and in the security derived from dependence upon determinate volumes of soil porosity as a ceiling on applications of the highly nebulous and erratic rates of permeability. (See also W75-03023) (Schict-ISWS)
W75-04923

NITRATE AND CHLORIDE MOVEMENT IN THE PLAINFIELD LOAMY SAND UNDER INTENSIVE IRRIGATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W75-04997

EFFECT OF TIME OF IRRIGATION ON THE DISTRIBUTION OF 1,2-DIBROMO-3-CHLOROPROPANE IN SOIL AFTER SHALLOW INJECTION,
California Univ., Davis. Dept. of Nematology.
For primary bibliographic entry see Field 5B.
W75-05065

VOLATILIZATION LOSSES OF PESTICIDES FROM SOILS,
California Univ., Riverside.
For primary bibliographic entry see Field 5B.
W75-05075

LOSSES OF FERTILIZERS AND PESTICIDES FROM CLAYPAN SOIL,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-05081

UTILIZING ERTS IMAGERY TO DETECT PLANT DISEASES AND NUTRIENT DEFICIENCIES, SOIL TYPES AND SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 3F.
W75-05133

SPECIFIC HEATS OF COMPONENTS OF FROZEN SOIL,
Guelph Univ., (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2C.
W75-05149

PROPOSED INDICES FOR ESTIMATING THE INHERENT WIND ERODIBILITY OF SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W75-05168

NOMOGRAPHIC INTERPRETATION OF WATER ABSORPTION DATA IN TERMS OF A TWO-PARAMETRIC DIFFUSIVITY-WATER CONTENT FUNCTION,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
L. Stroosnijder, and G. H. Bolt.
Soil Science Society of America Proceedings, Vol 38, No 6, p 876-880, November-December 1974. 5 fig, 2 tab, 13 ref.

Descriptors: *Diffusivity, *Absorption, Soil water movement, *Sorption, Saturation, Bulk density, Hysteresis, Wetting, Moisture content, Equations, Data collections.
Identifiers: Nomograms, Absorption curves, Pore-size distribution.

An exponential extrapolation of a set of experimentally determined diffusivities, as a function of water content, into the region near saturation led to an underestimate of the water absorption. A two-parametric expression for the diffusivity as a function of water content, as proposed by Ahuja et al. (1972), was used to construct a nomogram. This provided a connection between the standardized diffusivity-water content relationships according to Ahuja el al. and certain 'integral' properties of the absorption wetting process, namely, the sorptivity and a shape factor of the wetting front. Good agreement was obtained between experimentally determined diffusivity values and the values derived from the nomographical interpretation of water absorption data. The present approach also lends itself to the construction of families of scaled wetting curves. Thus, absorption behavior for different (uniform) initial moisture contents could be predicted adequately. Schicht-ISWS
W75-05180

SOIL-WATER PRESSURE DURING INTERMITTENT SIMULATED RAIN APPLICATION MEASURED WITH A NEW RAPID-RESPONSE TENSIOMETRIC TECHNIQUE,
Agricultural Research Service, Morris, Minn. North-Central Soil Conservation Research Center.
L. L. Sloneker, T. C. Olson, and W. C. Moldenhauer.
Soil Science Society of America Proceedings, Vol 38, No 6, p 985-987, November-December 1974. 4 fig, 2 tab, 1 ref.

Descriptors: *Soil water, *Soil pressure, *Tensiometers, *Simulated rainfall, Simulation analysis, Runoff, Puddling, Saturated soils, Irrigation, Measurement.
Identifiers: *Soil-water pressure, *Simulated runoff, Pressure transducers.

A method was described for measuring instantaneous changes in soil-water pressure in soil beds during intermittent application of simulated rainfall. Differences in soil water pressure do occur in soil beds, depending on nozzle off time. Intermittent off periods between nozzle on times affected soil-water pressure which influenced the accumulated rainfall energy required to initiate runoff. (Schicht-ISWS)
W75-05181

EFFECT OF WASH LOAD ON SEDIMENT TRANSPORTATION,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-05227

SEEPAGE FLOWS - GROUNDWATER POLLUTION INVESTIGATIONS,
Rutgers - The State Univ., New Burnswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-05273

PRELIMINARY DETERMINATIONS OF TRACE METALS IN HI-VOL PADS AND SOILS AROUND THE SOUTH END OF LAKE MICHIGAN,
Metropolitan Sanitary District of Greater Chicago, Ill. Research and Development Dept.
For primary bibliographic entry see Field 5A.
W75-05291

FLOW PATTERNS OF STEADY RAINFALL SEEPING THROUGH BEDDED LAND OR A HILLSIDE WITH A BARRIER AT GREAT DEPTH,
Virginia Polytechnic/Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 2F.
W75-05339

2H. Lakes

CONTINUOUS-FLOW STUDIES OF PHOSPHORUS AS A LIMITING NUTRIENT FOR CAYUGA LAKE PHYTOPLANKTON.
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5C.
W75-04891

CHLOROPHYLL A DISTRIBUTION IN LAKE HURON AND ITS RELATIONSHIP TO PRIMARY PRODUCTIVITY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-04892

ENVIRONMENTAL TESTING OF CITRATE: BIOASSAYS FOR ALGAL STIMULATION,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
For primary bibliographic entry see Field 5C.
W75-04893

WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W75-04894

MICROBIOLOGICAL EXAMINATION OF LAKE ONTARIO SEDIMENTS: I. DISTRIBUTION OF AEROBIC AND ANAEROBIC HETEROTROPHS IN SEVERAL LAKE ONTARIO SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-04896

MICROBIOLOGICAL EXAMINATION OF LAKE ONTARIO SEDIMENTS: II. HETEROTROPH METHODOLOGY COMPARISON.
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-04897

EFFECT OF PAPER PLANT POLLUTION AND SUBSEQUENT ABATEMENT ON A LITTORAL MACROINVERTEBRATE COMMUNITY IN LAKE ONTARIO: PRELIMINARY SURVEY,
State Univ., Coll., Oswego, N.Y. Lake Ontario Environmental Lab.
For primary bibliographic entry see Field 5C.
W75-04898

THE DISTRIBUTION OF DIATOMS ON THE SUPERFICIAL SEDIMENTS OF LAKE ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-04899

DISTRIBUTION OF CHLOROPHYLL A AND RELATED VARIABLES IN ONTARIO WATERS OF LAKE ST. CLAIR,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
For primary bibliographic entry see Field 5C.
W75-04900

METHANE PRODUCTION IN LAKE ERIE SEDIMENTS: TEMPERATURE AND SUBSTRATE EFFECTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W75-04901

BACTERIA-PHYTOPLANKTON RELATIONSHIPS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-04902

BENTHIC MACROFAUNA IN THE COASTAL ZONE OF SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W75-04903

NUTRIENT DISCHARGES TO GREEN BAY, LAKE MICHIGAN FROM THE LOWER FOX RIVER,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W75-04904

NUTRIENT ENRICHMENT AND ITS EFFECT ON PHYTOPLANKTON PRODUCTION AND SPECIES COMPOSITION IN LAKE SUPERIOR,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W75-04905

CHEMICAL CONTROL OF AQUATIC WEEDS AND ITS EFFECT ON THE NUTRIENT AND REDOX STATUS OF WATER AND SEDIMENT,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W75-04906

BACTERIAL AND PHYSICAL CHARACTERISTICS OF LAKE ONTARIO SEDIMENT DURING SEVERAL MONTHS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-04908

VARIATIONS IN THE PHYSICO-CHEMICAL PROPERTIES OF LAKE SUPERIOR,
National Ocean Survey, Detroit, Mich. Lake Survey Center.
For primary bibliographic entry see Field 5C.
W75-04909

TRACE ELEMENT DETERMINATIONS ON LAKE MICHIGAN TRIBUTARY WATER SAMPLES USING SPARK SOURCE MASS SPECTROMETRY.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W75-04910

REGIONAL CHARACTERIZATIONS OF THE THERMAL PROPERTIES OF LAKE ONTARIO,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
A. H. Lee.
In: Proceeding 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 625-634. 8 fig, 6 ref.

Descriptors: *Regions, *Thermal properties, *Lake Ontario, Depth, Spatial distribution, Bathythermographs, Seasonal, Advection, Winds, Water temperature.

The bathythermograph data collected on the Great Lakes Institute's Lake Ontario synoptic surveys of 1960-1969 were used in this analysis of horizontal temperature variations. At the time of the surveys, the surface temperature distributions were such that several regions, each having its more or less distinct temperature characteristics, could be delineated; a region with very cold waters in the outlet basin, a region with cold waters near the south shore, regions of intermediate temperature waters near the north shore and two regions with relatively warm waters in the offshore areas. Because of the obvious influence of water depth upon the thermal characteristics of a region, the lake was first divided into an inshore ring and an offshore core, with the 100 m depth contour arbitrarily used as the 'boundary.' Dividing Lake Ontario into seven regions has proved to be a fruitful approach in studying the observed horizontal temperature variations. It has been possible to explain the regional differences in thermal characteristics mainly in terms of two factors--the depth differences between regions and the advective heat flux resulting from the horizontal and vertical water movements. (Jones-Wisconsin)
W75-04911

DELINEATION OF GREAT LAKES ESTUARIES,
Ohio River Valley Sanitation Commission, Cincinnati.
R. A. Brant, and C. E. Herdendorf.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 710-718. 3 fig, 2 tab, 15 ref.

Descriptors: *Classification, *Estuaries, *Great Lakes, *Ohio, *Lake Erie, Water law, Lakes, Limnology, Dredging, Hydraulic properties, Lake shores, Lake morphology, Legal aspects, Riparian rights, Water levels.
Identifiers: *Lake estuaries, Cuyahoga River(Ohio), Maumee River (Ohio).

Whether or not dredging was on state property, i.e., submerged lands, or in the river with attendant riparian rights prompted study by the Ohio Geological Survey which took the position that the area was an arm of Lake Erie, thus an estuary. Consequently the State of Ohio possessed the submerged lands and minerals in trust for the people and proceeded accordingly. The Lake Erie estuaries extend as far as 25 km from what may be termed the estuary mouth. Common denominator

in defining estuaries is morphology, morphometry, and hydraulic relation of water level therein contained to the entering stream. Where land mass and stream profile rise above selected datum, the estuary begins and the river debouches. The concept can be useful in modeling water quality and physical attributes in connection with biotic, physical, limnologic, pollutional, and sedimentary and present geological processes. It can be usefully applied to identify and demonstrate margins of lakes, thus clarifying ownership disputes and clouded issues where demarkation of a lake and river arise. The judicial decisions should have general application in similar situations in the other Great Lakes and other large lakes. (Jones-Wisconsin)
W75-04912

RECREATIONAL USES OF GREEN BAY: BAY/NON-BAY USERS COMPARED,
Wisconsin Univ., Green Bay. Leisure Sciences Collateral.
For primary bibliographic entry see Field 6B.
W75-04913

THE UPPER NILE SWAMPS, A TROPICAL WETLAND STUDY,
J. Rzoska.
Freshwater Biol. Vol 4, No 1, p 1-30, 1974, Illus.
Identifiers: Birds, Cyperus-papyrus, Desmids, Ethiopia, Fauna, Mammals, *Nile River, Pistia-stratiotes, Plankton, Rivers, Sudan, *Swamps, Tropical areas, Uganda, Vegetation, Vertebrates, *Wetlands(Tropical).

The Upper Nile swamps lie in a flat featureless expanse of territory surrounded by a semi-circle of hills and mountains. Rivers enter this area from Ethiopia, Uganda and the Nile-Congo divide and have for thousands of years deposited sediments, mainly heavy clays. The rivers with a very slight slope are subject to heavy water losses by spill and evaporation. Three zones can be distinguished: permanent swamps which fringe rivers and standing water bodies; lands seasonally inundated by a combination of rising river levels and rainfall; and some dry ridges emerging a few meters above the flooded land. Rivers, standing waters and temporal inundations have different characteristics both in their chemico-physical make-up and their biological intensity. The most conspicuous difference is in the plankton; though the species are the same the densities in standing waters are much higher. The Bahr el Ghazal region shows a character of its own where richness of desmids indicates a peculiar limnological character. The role of currents in rivers is discussed, their complex differentiation creating varying opportunities for biological development. The region is inhabited by a number of Nilotic tribes whose annual life and migrations are dictated by the layout of the country and its hydrological regime. The higher vertebrate fauna is also adapted to the swamp conditions by composition (birds) or by migrations (mammals) as in humans. Two specific sections deal with the remarkable fauna of the floating plant Pistia stratiotes and the terrestrial fauna of umbels of Cyperus papyrus showing a succession from fresh to dry stage of the umbels.--Copyright 1974, Biological Abstracts, Inc.
W75-04996

'HUMAN-ACCELERATED EUTROPHICATION OF FRESH-WATER LAKES,' PROCEEDINGS OF A CONFERENCE,
Brooklyn Botanic Garden, Ossining, N.Y. Teatown Lake Reservation.
For primary bibliographic entry see Field 5C.
W75-05037

'EUTROPHICATION'--ITS CAUSES AND EFFECTS IN FRESH WATER LAKES,
New York State Dept. of Environmental Conservation, New Paltz.
For primary bibliographic entry see Field 5C.
W75-05038

LAKE FORMATION, SEDIMENTATION, CONTROL OF ALGAE, QUESTIONS,
Soil Conservation Service, New City, N.Y.
For primary bibliographic entry see Field 5C.
W75-05039

THE REGISTRATION STATUS OF SIMAZINE FOR SUBMERGED VASCULAR WEEDS AND ALGAE CONTROL IN PONDS,
Ciba-Geigy Corp., Greensboro, N.C.
For primary bibliographic entry see Field 5G.
W75-05040

LAKE DREDGING OPTIONS AND MECHANICAL WATER WEED HARVESTERS,
Folsom Marine Service Corp., Plymouth, N.H.
For primary bibliographic entry see Field 5G.
W75-05042

RESTORATION OF EUTROPHIC LAKES BY ARTIFICIAL HYPOLIMNETIC OXYGENATION,
Union Carbide Corp., Tarrytown, N.Y. Aquatic Environmental Sciences.
For primary bibliographic entry see Field 5C.
W75-05043

PUBLIC HEALTH REQUIREMENTS, SEWAGE DISPOSAL SYSTEMS, PERMITS REQUIRED FOR CHEMICAL TREATMENT OF AQUATIC VEGETATION, AUTHORIZED CHEMICALS, DREDGING PERMITS, SOURCES OF LAKE ENRICHMENT, BUILDING REGULATIONS,
Westchester County Dept. of Health, White Plains, N.Y. Div. of Environmental Health Services.
For primary bibliographic entry see Field 5G.
W75-05044

LAND USE AND ZONING, SEPTIC EFFLUENTS AND THE RESPONSIBILITY FOR ADEQUATE CONTROL,
Yorktown School System, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 5G.
W75-05045

AN AUTOMATIC UNDERWATER CAMERA SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 5A.
W75-05048

A SUBMERSIBLE AUTOMATIC DISSOLVED OXYGEN-TEMPERATURE MONITORING SYSTEM,
Environmental Protection Agency, Fairview Park, Ohio. Ohio District Basin Office.
For primary bibliographic entry see Field 5A.
W75-05049

PHOSPHORUS AND HYPOLIMNIAL DISSOLVED OXYGEN IN LAKE ERIE,
Canadian Wildlife Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5C.
W75-05050

SURFACE NITROGEN AND PLANKTON IN SKAHA LAKE, BRITISH COLUMBIA (CANADA),
British Columbia Univ., Vancouver. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-05053

EXPERIMENTAL LAKES AREA: WHOLE-LAKE EXPERIMENTS IN EUTROPHICATION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W75-05057

HYDROBIOLOGICAL OBSERVATIONS ON THREE RHODESIAN RESERVOIRS,
Rhodesia Univ., Salisbury. Div. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-05059

EXPERIMENTAL DREDGING TO CONVERT LAKE BOTTOM FROM ABIOTIC MUCK TO PRODUCTIVE SAND,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
For primary bibliographic entry see Field 5G.
W75-05060

OCCURRENCE OF MORPHOLOGICALLY ABNORMAL SYNEDRA POPULATIONS IN LAKE SUPERIOR PHYTOPLANKTON,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W75-05062

THE 'OLIGOTROPHICATION' OF LITTLE OTTER LAKE, PARRY SOUND DISTRICT,
Ministry of Environment, Rexdale (Ontario). Limnology and Toxicity Branch.
For primary bibliographic entry see Field 5C.
W75-05063

ANAEROBIC METABOLISM IN LAKE WASHINGTON SEDIMENTS,
Washington Univ., Seattle, Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W75-05064

PHOSPHATE, ALGAE AND TACONITE TAILINGS IN THE WESTERN ARM OF LAKE SUPERIOR,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W75-05067

SEDIMENTS AND SEDIMENT-WATER NUTRIENT INTERCHANGE IN UPPER KLAMATH LAKE, OREGON,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W75-05079

ESTIMATING NUTRIENT LOADINGS OF LAKES FROM NON-POINT SOURCES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5C.
W75-05082

EVALUATION OF THE POTENTIAL FISH PRODUCTIVITY OF A RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
N. A. Gordeev, A. G. Poddubnyi, and L. K. Il'ina.
Vopr Ikhtiol. 14(1): 20-25. 1974.
Identifiers: Burbot, Carp, Crucian, Dace, Ecosystem, Energy, *Fish productivity, Loach, Perch, Pike, *Productivity, Reservoirs, Rivers, Roach, Rudd, Ruff, Tench, *USSR(Rybinsk reservoir), Volga River.

A study of the potential productivity of fish (roach, perch, ruff, dace, crucian carp, pike, rudd, tench, loach, burbot, etc.) of the Rybinsk Reservoir on the Volga (USSR) showed that by conducting standard fishery measures it is possible to increase the specific yield of fish production by not more than twofold. An analysis of the balance between replenishment and loss in populations of mass fish species showed that it is possible to increase fish productivity if a thorough study is made of the structure and energy balance of the natural communities to determine the most viable equilbria and interactions with man which will enable complete utilization of the potential production capabilities of these ecosystems.--Copyright 1974, Biological Abstracts, Inc.
W75-05094

ECOLOGY OF THE BUCHARAN ROACH RUTILUS RUTILUS BUCHARENSIS G. NIKOLSKIJ OF THE UCHKYZYL RESERVOIR OF THE SURKHAN-DARYA RIVER BASIN, (IN RUSSIAN),
Karshinskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
A. A. Amanov.
Vopr Ikhtiol. 14(1): 50-56. 1974.
Identifiers: Algae, Chironomidae, *Distribution(Fish), Ecology, Fecundity, *Morphology, Plankton, Reservoir, River basins, *Roach, Rutilus-rutilus-bucharensis, *USSR(Uchkyzyl reservoir), Uzbek-SSR, Zooplankton.

Data are presented on the distribution, morphology, and age and sex variability of the Bucharan roach Rutilus rutilus bucharensis in waters of the Surkhan-Darva River basin in the Uzbek SSR (USSR) and information on the spawning season, fecundity, growth and commercial value of the roach in the Uchkyzyl reservoir, where the roach becomes sexually mature at an age of 2-3 yr at a length of 10-14 cm. In the reservoir the mature roach feed mainly on algae and Chironomidae larvae and the juveniles on zooplankton.--Copyright 1974, Biological Abstracts, Inc.
W75-05102

KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W75-05110

THE FATE OF NITRATE IN LAKE SEDIMENT COLUMNS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W75-05155

PLANKTON POPULATIONS OF LAKE LEAKE AND TOOMS LAKE: OLIGOTROPHIC TASMANIAN LAKES,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W75-05183

MERCURY LEVELS IN LAKE POWELL: BIOAMPLIFICATION OF MERCURY IN MAN-MADE DESERT RESERVOIR,
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 5A.
W75-05185

INTERNAL GRAVITY WAVES IN A SLOWLY VARYING, DISSAPATIVE MEDIUM,
Melbourne Univ., Parkville (Australia).
For primary bibliographic entry see Field 2E.
W75-05188

POSSIBILITIES OF CONVERTING PART OF THE PIRITU LAGOON (STATE OF ANZOATEGUI) INTO AN ARTIFICIAL SALT PIT, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 3E.
W75-05276

PRELIMINARY DETERMINATIONS OF TRACE METALS IN HI-VOL PADS AND SOILS AROUND THE SOUTH END OF LAKE MICHIGAN,
Metropolitan Sanitary District of Greater Chicago, Ill. Research and Development Dept.
For primary bibliographic entry see Field 5A.
W75-05291

DYNAMIC REDISTRIBUTION OF METHYLMERCURY IN A POND ECOSYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W75-05295

PHOSPHORUS INPUTS AND ALGAL BLOOMS IN LAKES,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 5C.
W75-05337

2I. Water In Plants

FEEDING IN THE PORCELAIN CRAB, PETROLISTHES CINCTIPES (RANDALL) (ANOMURA: PORCELLANIDAE),
University of Southern California, Los Angeles. Allan Hancock Foundation.
M. K. Wicksten.
Bull South Calif Acad Sci, Vol 72, No 3, p 161-163. 1973. Illus.
Identifiers: *Absorption, Anomura, *Crabs(Porcelain), Digestion, Feeding, Petrolisthes-Cinctipes, Porcellanidae, *Predator-prey relationships.

The feeding process in P. CINCTIPES IS DESCRIBED FROM THE CAPTURE OF PREY TO ITS ABSORPTION IN THE MIDGUT. Foods accepted by animals in the laboratory and found in the stomachs of field specimens are listed. Means by which the porcelain crab rejects particles unsuitable for digestion are discussed.--Copyright 1974, Biological Abstracts, Inc.
W75-04907

METHODS FOR STUDIES OF PLANKTON (IN SWEDISH),
For primary bibliographic entry see Field 7B.
W75-05061

THE USE OF COLOR INFRARED AERIAL PHOTOGRAPHY IN DETERMINING SALT MARSH VEGETATION AND DELIMITING MAN-MADE STRUCTURES OF LYNNHAVEN BAY, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W75-05126

UTILIZING ERTS IMAGERY TO DETECT PLANT DISEASES AND NUTRIENT DEFICIENCIES, SOIL TYPES AND SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 3F.
W75-05133

EFFECTS OF PLANT DENSITY, IRRIGATION AND POTASSIUM AND SODIUM FERTILIZERS ON SUGAR BEET: I. YIELDS AND NUTRIENT COMPOSITION,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
A. P. Draycott, M. J. Durrant, and D. J. Webb.
J Agric Sci Vol 82, No 2, p 251-159, 1974. Illus.

Descriptors: *Plant growth, *Nutrients, Potassium compounds, *Fertilizers, Sodium compounds, *Irrigation effects, *Vegetable crops.
Identifiers: *Beets, *Sugar beets.

Three experiments (1970-2) on calcareous sandy loam tested all combinations of 4 plant densities (18,500-124,000 plants/ha), 2 amounts of K (0, 156 kg/K/ha) and Na (0, 247 kg/Na/ha) fertilizer and 2 watering treatments on yield and chemical composition of sugar beet. The main effects of the treatments in all 3 experiments confirmed that at least 75,000 plants/ha were needed for maximum sugar yield, that Na fertilizer increased sugar yield more than K (+0.76 and +0.29 t(tons)/ha respectively) and that the crop responded to irrigation in some years (+1.35 t sugar/ha in 1970 and +1.67 t/ha in 1972). Analysis of the growth of the crop showed that increasing the plant density increased leaf growth per unit area from singling onwards and giving irrigation increased it from July; the effects persisted until harvest and were reflected in increased sugar yields. Fertilizer increased leaf growth early in the season but the effect disappeared later, although sugar yield was still increased. Interactions between plant density, fertilizer treatment and irrigation were small every year but there were some consistent effects on sugar yield. The results suggest that in commercial practice the optimum density is 75,000 plants/ha; where irrigation is not practiced, 247 kg/ha of Na and 70 kg/ha of K fertilizer should be given. Where irrigation is applied, only 247 kg/ha of Na needs to be given as the extra water increases the uptake of soil K.--Copyright 1974, Biological Abstracts, Inc.
W75-05265

THE UPTAKE AND SOME PHYSIOLOGICAL EFFECTS OF CADMIUM ON CORN,
Illinois Univ., Urbana. Dept. of Agromony.
For primary bibliographic entry see Field 5C.
W75-05290

PATTERNS OF TRACE-ELEMENT DISTRIBUTION IN A FORESTED WATERSHED,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W75-05296

ROOT DEVELOPMENT AND NUTRIENT UPTAKE BY CORN GROWN IN SOLUTION CULTURE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W75-05305

2J. Erosion and Sedimentation

SEDIMENT LOADS IN CANADIAN RIVERS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
W. Stichling.
Water Resources Branch. Technical Bulletin No 74, 27 p, 1974, 7 ref, 25 fig.

Descriptors: *Rivers, *Sediment load, *Sediment transport, *Equipment, Erosion, Sedimentation, Suspended solids, Data collections, Surveys, Sediment yield, Sampling, Bed load, Hydrologic data, *Canada.
Identifiers: River morphology.

The history of sediment data program initiated in Canada in 1961 is reviewed, the equipment in use

for measuring suspended sediment and bed load is described and the methods used by the Water Survey of Canada for collecting and processing the data are outlined. Data collection techniques used in Canada are compared with those in other countries. An attempt is made to summarize the data available for the 10 year period 1960-1970 and to interpret these data in terms of Canadian watersheds. Maps illustrating the average suspended sediment concentration and the average annual sediment yield per square mile are printed. The usefulness of sediment transport data for water resource planning and erosion control is pointed out. (Environment Canada)
W75-04886

TECHNIQUES FOR TRACING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
D. E. Nelson, and J. P. Coakley.
Canada Centre for Inland Waters, Scientific Series, No 32, 1974, 40 p, 2 fig, and 3 tab, 411 ref.

Descriptors: *Sediment transport, *Tracking techniques, Sedimentation, Fluorometry, Fluorescent dye, Instrumentation, Analytical techniques, *Bibliographies, Neutron, Activation analysis, Radioisotopes, Pollutant identification, Spectrophotometry.
Identifiers: *Radioactive tracers, Thermoluminescence, Atomic absorption.

A comprehensive review is presented of methods and concepts applied to determining sediment movement using artificial tracers. Conventional techniques such as radioactive and fluorescent tracing, as well as the less developed techniques involving neutron activation and thermoluminescence are examined and assessed for possible use in Great Lakes Studies. (Environment Canada)
W75-04889

FURTHER STUDIES ON THE HEAVY METAL LEVELS IN OTTAWA AND RIDEAU RIVER SEDIMENTS,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W75-04890

THE OVERLAND FLOW PROCESS UNDER NATURAL CONDITIONS,
Purdue Univ., Lafayette, Ind., Agricultural Experiment Station.
For primary bibliographic entry see Field 4A.
W75-04920

SEDIMENT YIELD AS RELATED TO VEGETATION ON SEMIARID WATERSHEDS,
Geological Survey, Denver, Colo.
L. M. Shown.
In: Biological Effects In The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p347-354. 2 tab, 8 ref.

Descriptors: *Sediment yield, *Vegetation, *Erosion control, Runoff, Watershed management, Sediments, Watersheds(Basins), Slopes, Soil types, Drainage density, Overland flow.
Identifiers: *Semiarid watersheds, Watershed slope, Channel density, Mulch, Cornfield Wash Watersheds(N Mex), Boco Mountain Watersheds(Col).

Amount of vegetation plus mulch cover was found to explain 79 percent of the variance in sediment yield for a set of eight watersheds that represented the full range of hydrologic, geologic, and biotic conditions in the Cornfield Wash area of New Mexico. Vegetation amounts appeared to be the result of the integrated effects of slopes, soil types, and drainage densities. Because these same variables also affect runoff and sediment yield, a high degree of correlation existed between vegetation cover and runoff and sediment yield. A short record at the Boco Mountain watersheds in Colorado indicated that sediment yield was greatly reduced when big sagebrush cover was converted to beardless bluebunch wheatgrass cover. This was attributed to a significant increase in vegetation plus mulch cover on the grassed watersheds which reduced runoff during the April-to-October period, and which appeared to retard overland flow, decrease soil detachment, and decrease rilling. (See also W75-03023) (Yang-ISWS)
W75-04927

THE INFLUENCE OF VEGETATION AND VEGETATIVE MULCHES ON SOIL EROSION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4C.
W75-04928

TRANSPORT PROCESSES OF PARTICLES IN DILUTE SUSPENSIONS IN TURBULENT WATER FLOW--PHASE III,
Illinois Univ., Urbana. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5B.
W75-04933

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates, Engineers, San Francisco, Calif.
For primary bibliographic entry see Field 8D.
W75-05117

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEMS STUDIES, VOLUME III,
Tennessee Univ., Knoxville. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W75-05125

THE FATE OF NITRATE IN LAKE SEDIMENT COLUMNS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W75-05155

DISPERSION OF DREDGE SPOIL DUMPED IN NEAR-SHORE WATERS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W75-05167

PROPOSED INDICES FOR ESTIMATING THE INHERENT WIND ERODIBILITY OF SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
S. R. Simmons, and A. D. Dotzenko.
Journal of Soil and Water Conservation, Vol 29, No 5, p 275-276, November-December 1974. 2 fig, 1 tab, 9 ref.

Descriptors: *Soil physical properties, *Wind erosion, Erosion rates, Winds, Soil moisture, Soil erosion, Cation exchange, Soil stability, Indicators.

Highly significant correlations of percentages of erodible dry soil fractions and the resistance of nonerodible aggregates to breakdown, as determined by rotary dry sieving, were found among several properties of some erodible eastern Colorado soils. Cation exchange capacity (CEC) and 15-bar moisture percentage, as indicators of the nature of the soil inorganic-organic colloidal complex, gave comparable or higher correlation coefficients than either soil texture or organic matter determinations. CEC and 15-bar soil moisture percentage as indexes of a soil's inherent erodibility were proposed. (Jess-ISWS)
W75-05168

EXPERIMENTAL STUDY OF RILL EROSION,
Colorado State Univ., Fort Collins. Dept. of Geology.
M. P. Mosley.
Transactions of the American Society of Agricultural Engineers, Vol 17, No 5, p 909-916, September-October 1974. 7 fig, 20 ref.

Descriptors: *Rill erosion, *Soil erosion, *Erosion, Surface runoff, Gully erosion, Sheet erosion, Overland flow, Geomorphology, Geology, Raindrops, Sediment yield, Slopes.
Identifiers: *Fluvial morphology, Rainsplash, Microrilling, Rill cutting.

A rainfall-runoff facility 15.3 m long by 9.2 m wide by 2 m deep filled with a siltsand mixture to which artificial precipitation could be applied was used for an experimental study of rill erosion. The mixture was shaped into four plane, two convergent, and two divergent surfaces with different inclinations. Sediment yields from 112 rill systems were significantly affected by slope shape, and were positively related to slope angle, slope length, and rill density per unit area. Most sediment discharged from a given rill system was apparently detached by the rill itself, the amount of material detached by the other processes observed (Rainsplash, overland flow, and microrilling) relatively small. (Jess-ISWS)
W75-05178

SEDIMENT TRANSPORTATION, VOLUME I.
International Association for Hydraulic Research, Delft (Netherlands).
Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand. p 849.

Descriptors: *Conferences, *Sediment transport, *Sediment yield, *Sediment control, *Depositionsediments), *Scour, Bed load, Suspended load, Sediment distribution, Channels, Stream erosion, Hydraulic structures, Rivers, Movement, Porous media, Meanders, Flow, Streams, Dams, Streamflow, River beds, Foreign countries.
Identifiers: *River mechanics.

River mechanics was discussed at a symposium held at Bangkok in 1973. The four broad topics discussed in Volume I were: (1) sediment yield and deposition, (2) sediment control and scour, (3) sediment transportation, and (4) river bed form. (See also W75-05193 thru W75-05259) (Humphreys-ISWS)
W75-05192

TWO DIMENSIONAL JET DIFFUSION ON SLOPING FLOORS UNDER FINITE SUBMERGENCE,
Alberta Dept. of Environment, Edmonton. Water Resources Div.
For primary bibliographic entry see Field 8B.
W75-05193

ANALYSIS OF AGGRADATION UPSTREAM OF A DAM,
Roorkee Univ. (India). Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-05194

BHUMIBOL RESERVOIR-SEDIMENT STATUS AFTER EIGHT YEARS OF OPERATION,
Electricity Generating Authority of Thailand, Nonthaburi.
S. Chitchob, and J. E. Cowley.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 35-45, 3 fig, 2 tab.

Descriptors: Reservoir silting, *Sediment yield, *Sedimentation rates, *Trap efficiency, *Bottom sediments, Silting, Sedimentation, Silts, Sediments, Reservoirs, Impounded waters, Impoundments, Electric power, Reservoir operation, Lakes, Measurement, Surveys, Mapping.
Identifiers: *Thailand(Bhumibol Reservoir), Ping River.

In 1970 a survey of the 13,000-mcm Bhumibol Reservoir in northern Thailand was carried out to provide initial reference maps at a number of index stations, which will be used in monitoring changes in reservoir geometry. Comparisons of the bottom contours and sediment samples observed in this survey with records of surveys made before impoundment of water in 1963 provided enough information to identify the dominant mechanisms of sediment movement in the reservoir. The total sediment yield of the watershed in the intervening years was estimated at 175 mcm, corresponding to an average rate of delivery of sediments of about 0.5 mm per year from the entire basin. These estimates confirm that the time when the usefulness of the resevoir will be seriously restricted by the buildup of sediment is very remote. (See also W75-05192) (Sanderson-ISWS)
W75-05195

DEBRIS SLOPES ABOVE SAND BARRIERS,
Tokushima Univ. (Japan). Dept. of Hydraulic Engineering.
S. Sugio, M. Hashino, and E. Sasaki.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 47-58, 8 fig, 1 tab, 6 ref, 2 append.

Descriptors: *Sediments, *Sediment yield, *Deposition(Sediments), *Sediment transport, *Bed load, Sands, Barriers, Mannings equation, Basins,, Rivers, Rainfall, Runoff, Channels, Slopes, Equations.
Identifiers: *Debris slopes, *Slope ratio, Japan.

The anticipated debris slopes above sand barriers constructed in the extreme upstream reaches of sediment-yielding streams were described. Many more variable affecting the debris slope than those used by previous investigators were taken into account and discussed. A modified Murano's formula was derived to estimate the ultimate debris slope. For preliminary design purposes, the relationship between the debris slope, S, and the original bed slope, So, was discussed for field data collected in Japan. It appeared that as the original bed slope increases, the slope ratio tends to increase slightly. (See also W75-05192) (Schicht-ISWS)
W75-05196

AN APPROACH TO THE SEDIMENT YIELD ESTIMATION BY SPECTRAL ANALYSIS OF MOUNTAIN RELIEF,
Gifu Univ. (Japan). Dept. of Civil Engineering.
S. Komura, and M. Kubota.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 59-70, 17 fig, 3 tab, 1 ref, 1 append.

Descriptors: *Landslides, *Topography, Drainage density, Streams, Basins, *Sediment yield, Forecasting.
Identifiers: *Power spectral density, *Wavelength region, Radial lines, Japan.

Landslides may occur as a reciprocal action of many factors and occasions. These factors and occasions can be considered to be changing in time and space, making it very difficult to forecast landslides. Previous studies on the relationship between the landslide and topographical factors conducted only measurements of the landslide area that occurred in a basin and could not predict the direction where a landslide may occur. The results of spectral analysis of the steepest gradient in the basins were described. It was indicated that there was a possibility of forecasting the direction of a landslide. (See also W75-05192) (Schicht-ISWS)
W75-05197

TECHNIQUES OF MEASUREMENT OF SILT DEPOSITION IN VICTORIAN RESERVOIRS,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
R. E. Holmes.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 71-79. 3 fig.

Descriptors: *Reservoir silting, *Sediment yield, *Sedimentation rates, *Trap efficiency, *Bottom sediments, Silting, Sedimentation, Deposition(Sediments), Silts, Reservoirs, Impoundments, Australia, Surveying instruments, Measurement, Surveys, Sounding, Mapping.
Identifiers: *Silt survey lines, *Victorian reservoirs.

The system of establishment and subsequent resurvey techniques of silt lines as used to determine the rate of sediment accretion in Victorian reservoirs was outlined. The total volume of silt was computed by determining a mean depth of silt deposition along each silt survey line which was applied to a specific area of the reservoir. The probable accuracy of determination of mean depth of silt on each line was considered to be about 1-2 cm because of the large number of samples obtained. The validity of applying this mean depth to a large area of the reservoir is questionable, and depends heavily on the proper selection of location for the silt lines. (See also W75-05192) (Sanderson-ISWS)
W75-05198

SCOUR IN RIVER BASIN AND IN ITS BED MECHANISM, FORECAST,
Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR).
T. E. Mirtskhoulava.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 81-91, 9 ref.

Descriptors: *Scour, *Erosion, *Watersheds(Basins), *Sediment discharge, Soil erosion, Sheet erosion, Cohesionless soils, Cohesive soils, River beds, Alluvial channels, Depth, Forecasting.

The amount of washout from watershed slopes as a result of soil water erosion can be determined by suggested equations relating the slope and length, properties and initial humidity of soils composing the slope, intensity and duration of precipitation, kind of vegetation, and man's economic activity on the slopes. Bedside velocity of sheet and bed flow at which the scour starts was determined withdue regard for characteristics of soils composing the slope, the bed, and sheet, and bed flows and flow transporting capacity. A technique was suggested for estimation of general scour of separate sections of bed for changing hydrological regime. When beds are composed of cohesive soils, a relationship was given to allow determination of the scour process with time, taking into account physico-technical indices of soil resistance to rupture and hydraulic parameters of scouring flow. An equation was given for calculation of flow influence time with regard for the non-eroding velocities of non-cohesive soils. Equations resulting from investigations were given, however, no data were presented.(See also W75-05192) (Humphreys-ISWS)
W75-05199

ESTIMATING AVERAGE SEDIMENT YIELDS FROM ANNUAL STREAMFLOW AND SEDIMENT RECORDS,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 4A.
W75-05200

STUDY ON LOCALISED SCOUR AROUND A BRIDGE PIER AND ITS PREVENTION,
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05201

DEFORMED PIERS TO CONTROL THE DOWNSTREAM EROSION,
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05202

INCIPIENT MOTION OF BED MATERIAL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05203

SCOUR AT DOWNSTREAM END OF DAMS IN TAIWAN,
National Taiwan Univ., Taipei. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05204

SEDIMENTATION DAMAGE OF HYDRAULIC STRUCTURES IN TAIWAN,
Taiwan Water Resources Planning Commission, Taipei. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W75-05205

MODELING OF LOCAL SCOUR AROUND SPUR DIKES IN STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 8B.
W75-05206

THE EFFECT OF SILLS ON RIVER BED,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 8B.
W75-05207

THEORY OF VISCOUS FLOW IN WIDE CURVED OPEN CHANNELS,
Technische Hogeschool, Delft (Netherlands). Lab. of Fluid Mechanics.
For primary bibliographic entry see Field 8B.
W75-05208

SECONDARY CURRENTS IN SUBSEQUENT MODEL BENDS,
Karlsruhe Univ., (West Germany). Theodor-Rehbock-Lab. for River Improvement.
For primary bibliographic entry see Field 8B.
W75-05209

ECONOMIC REVETMENTS FOR PROTECTING THE BANKS OF MERIC AND ERGENE RIVERS FLOOD CANALS AGAINST WAVE EROSION,
State Hydraulic Works, Ankara (Turkey). Dept. of Research.
For primary bibliographic entry see Field 8B.
W75-05210

SEDIMENT CONTROL AND REMEDIAL WORKS IN THE BRANTAS RIVER, JAVA, INDONESIA,
Ministry of Public Works, Djakarta (Indonesia). Directorate General of Water Resources.
For primary bibliographic entry see Field 4D.
W75-05211

LANG LANG RIVER, VICTORIA ATTEMPTS TO CONTROL SEDIMENT, EROSION AND FLOODS,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 4D.
W75-05212

CHAO PHYA RIVER TRAINING WORKS,
Royal Irrigation Dept., Bangkok (Thailand).
For primary bibliographic entry see Field 8A.
W75-05213

STABILITY OF TIDAL RIVERS AND METHODS FOR DETERMINATION OF THE CORRECTIVE WORKS,
Calcutta Port Commissioners (India).
For primary bibliographic entry see Field 8B.
W75-05214

SETTLING CUM FLUSHING TANK ON TRISULI POWER CHANNEL,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 8B.
W75-05215

INFLUENCE OF SUSPENDED SEDIMENT DISTRIBUTION ON SETTLING BASIN DESIGNS,
Mahaweli Development Board, Colombo (Sri Lanka).
For primary bibliographic entry see Field 8B.
W75-05216

WATER INTAKE PROBLEMS IN TORRENTS,
Technical Univ., of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 8B.
W75-05217

THE VELOCITY DEFECT LAW AND THE SEDIMENT TRANSFER COEFFICIENT IN AN OPEN CHANNEL,
Africultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 8B.
W75-05218

TURBULENCE MEASUREMENTS OVER SAND BEDS,
California State Univ., Sacramento. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05219

FLOW RESISTANCE IN SAND BED CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05220

FLOW AND RESISTANCE CHARACTERISTICS OF SAND BED CHANNELS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W75-05221

THE INFLUENCE OF THE RELATIVE DEPTH ON THRESHOLD OF GRAIN MOTION,
State Hydraulic Works, Ankara (Turkey). Dept. of Research.
S. Aksoy.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 359-370. 5 fig, 8 ref.

Descriptors: *Alluvial channels, *Movement, *Sediments, *Theoretical analysis, Cohesionless soils, Particle size, Coarse sediments, Sediment transport, Flow, Tractive forces, Drag, Beds, Saltation.
Identifiers: Incipient motion, Shields equation.

A number of experimental and theoretical studies on the threshold of grain motion were made in terms of the properties of particles and fluid, and character of the flow. The history of these investigations primarily represent two methods based on critical mean velocity and critical tractive force. The influence of the relative flow depth on the threshold condition was not specifically considered. The effect of the ratio of hydraulic radius/grain diameter (R/D) was discussed. An equation for the equilibrium condition at the time of incipient motion was derived. The general functional relationship implied that the critical condition is a function of R/D. With the experimental curve determined by Shields, the derived relationship was plotted on a diagram for various values of the parameter R/D. It was shown that for natural sediment and water at 20C, the critical slope, J, becomes independent of grain diameter D if D is approximately greater than 6 mm. The critical slope is then only a function of D/R and the value of J was given as $J = 0.10(D/R)$. (See also W75-05192) (Humphreys-ISWS)
W75-05222

INSTANTANEOUS TURBULENT FLOW ACTS ON THE SAND PARTICLE TO START THE ROTATION ON THE BED,
Kobe Univ. (Japan). Dept. of Civil Engineering.
M. Yano.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 371-382. 9 fig, 4 ref.

Descriptors: *Alluvial channels, *Saltation, *Laboratory tests, *Flow characteristics, Tractive forces, Boundary layers, Turbulent boundary layers, Bottom sediments, Movement, Turbulent flow, Velocity, Profiles, Turbulence, Sands, Sediments, Drag.
Identifiers: River mechanics.

The characteristics of the turbulent flow above and below the surface of the bed in a channel were measured by using a coated hot wire. The characteristics of the turbulence and mean flow above the bed were similar to those of turbulent boundary layer flow with the mean velocity on the bed surface. The instantaneous turbulence behind the sand particle had a sharp peak form and strong intensity when the particle began rotating on the bed. The intensity of the instantaneous peak turbulence, turbulent vorticity, and the scale of the turbulent eddy seemed to be related with the trigger flow that starts the rotation of the sand particle. The tractive mechanism of the rough sand particle of the bed was considered the same as the drag of an immersed body. The basic mechanics of the movement of the rough sand particle also seemed to be the same as that of an immersed body in the flow. (See also W75-05192) (Humphreys-ISWS)
W75-05223

A PROBABILISTIC APPROACH TO THE INITIATION OF MOVEMENT OF NONCOHESIVE SEDIMENTS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
A. J. Sutherland, and H. M. Irvine.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 383-393. 4 fig, 10 ref.

Descriptors: *Alluvial channels, *Saltation, *Laboratory tests, *Flow characteristics, Statistical models, Probability, Sediments, Cohesionless soils, Movement, Theoretical analysis, Entrainment, Dimensional analysis, Stability, Evaluation, Turbulent flow, Bottom sediments.
Identifiers: *River mechanics.

A probabilistic model of a grain's instability due to fluctuations in lift pressure and shear stress was proposed. This yields a relationship from which critical values of shear stress can be determined by experiment. Results for grain mixtures (sizes from 0.4 to 4.7 mm) were interpreted in terms of a dimensional analysis. A functional relationship, consisting of an entrainment parameter, the particle Reynolds number, and the geometric standard deviation, sigma, of the grain mixture described the initiation of motion from mixtures with grain sizes greater than 1.2 mm and sigma less than 1.4. For these mixtures an effective diameter could be used, the probability being independent of grain size. With larger values of sigma the individual grain size became important, the probability decreasing as grain size increased. (See also W75-05192) (Humphreys-ISWS)
W75-05224

BEHAVIOR OF SEDIMENT MIXTURES IN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Gessler.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 395-405. 2 fig, 14 ref.

Descriptors: *Sediment sorting, *Alluvial channels, *Statistical models, *Sediment transport, Gradation, Theoretical analysis, Sediments, Rivers, Bottom sediments, Cohesionless soils, Stochastic processes, Movement, River beds, Shear stress, Channels.
Identifiers: *River mechanics, Channel armoring.

The behavior of sediment mixtures in rivers is very different from the behavior of uniform material. A stochastic model, describing the removal process of grains, which appears to be most realistic remains useless because the joint distribution function of the two random variables, shear stress and critical shear stress, is yet unknown. The process is unsteady and under final conditions of an armor development the two random variables are certainly dependent. A simplified model based on the shear stress as the only

random variable together with some similarity considerations led to a prediction equation for the critical shear stress of a mixture in a river bed. Experimental evidence was used to verify the concept. Prolonged periods of time with bottom shear stresses higher than the critical shear stress would eventually lead to a change in slope of the river bed. (See also W75-05192) (Humphreys-ISWS)
W75-05225

STUDIES ON BED-LOAD TRANSPORT RATE IN OPEN CHANNEL FLOWS,
Kyoto Univ. (Japan). Disasters Prevention Research Inst.
For primary bibliographic entry see Field 8B.
W75-05226

EFFECT OF WASH LOAD ON SEDIMENT TRANSPORTATION,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
K. Subramanya, and A. J. Valsangkar.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 419-430. 4 fig, 2 tab, 5 ref.

Descriptors: *Settling velocity, *Suspended load, *Laboratory tests, *Sedimentology, Particle size, Suspension, Viscosity, Velocity, Sedimentation rates, Movement, Suspended solids, Methodology, Measurement, Water properties, Clays, Kaolinite, Montmorillonite, Bentonite, Silts.

An experimental study on the settling of silt size particles in clay suspensions under static condition was presented. Study of the statical settling behaviour of silt size particles in clay suspensions indicated that: (1) clay content less than 0.5% by weight in suspension does not have any effect on the settling of silt size particles. (2) Concentrations greater than 0.5% cause the fluid properties to be different from that of pure water. Bentonite clay caused a gradual change in relative viscosity with respect to the suspension concentration while montmorillonite gave a rapid change at about 1.5% concentration level. (3) The increase in relative viscosity of a clay suspension affecting the settling of silt size particles was also dependent upon the amount of clay size particles already present in the settling particles. The relative viscosities of various clay suspensions, as affecting the settling of silt size particles, were presented. (See also W75-05192) (Humphreys-ISWS)
W75-05227

A NUMERICAL STUDY OF THE SUSPENSION OF A NON-BUOYANT PARTICLE WITHIN A TURBULENT FLOW,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
I. R. Wood, and B. S. Jenkins.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 431-442. 4 fig, 6 ref.

Descriptors: *Suspension, *Suspended solids, *Mathematical models, *Turbulent flow, Numerical analysis, Model studies, Settling velocity, Velocity, Movement, Hydrodynamics, Eddies, Equations, Laboratory tests, Energy transfer, Flow characteristics, Computer models.
Identifiers: Non-bouyant particle, Trajectory, Two-dimensional flow, Eddy model.

The little-understood process of the suspension of a non-buoyant particle within a turbulent flow was examined. The basis of the investigation was the determination of the trajectory of an individual particle within the flow. Particle trajectories were computed by digital computer. The flow modeled was a two-dimensional array of eddies. The computed trajectories of non-buoyant particles within the model eddy field demonstrated that the fall velocity of a non-buoyant particle may be modified by the action of vertical components of fluid velocity, even when the net vertical motion of the fluid is zero. It was demonstrated that a non-buoyant particle can, under appropriate conditions, be suspended indefinitely within an individual eddy. A particle thus suspended was found to effect a net transfer of energy between different zones of the eddy. When the conditions for suspension of the particle were not fulfilled, the particle fell through the eddy field with a velocity that generally exceeded the settling velocity of the particle in the quiescent fluid. The results are to some extent specific to the particular conditions applied in the computations performed. The results do, however, yield some insight into the mechanism of suspension of a non-buoyant particle within a turbulent flow, and demonstrate the potential usefulness of the eddy model in the examination of this phenomenon. (See also W75-05192) (Humphreys-ISWS)
W75-05228

CALCULATIONS OF SUSPENDED LOAD IN ALLUVIAL CHANNEL,
Public Works Research Inst., Tokyo (Japan). River Hydraulic Section.
A. Tsuchiya, and K. Hoshihata.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 443-454. 7 fig, 6 ref.

Descriptors: *Sediment discharge, *Suspended load, Alluvial channels, Bed load, Running waters, Tractive forces, Sediment distribution, Evaluation, Sediment transport, Laboratory tests, Equations.
Identifiers: *River mechanics.

Calculation methods proposed by Einstein, Lane-Kalinske, and Laursen for suspended sediment discharge were evaluated by comparing calculated values with experimental laboratory data measured by the U.S. Geological Survey. The results indicated closer agreement with the methods of Einstein and Laursen than calcualted values obtained by the Lane-Kalinske method. A derived equation for calculating total sediment discharge was proposed. An equation was given as (average sediment concentration) = (alpha)P(tau) (effective tractive force/critical tractive force - 1); where alpha is a constant, P is the same function used in the Lane-Kalinske method, and tau is a nondimensional expression of effective tractive force. (See also W75-05192) (Humphreys-ISWS)
W75-05229

EFFECT OF PHYSICO-CHEMICAL PROPERTIES OF FINE SUSPENDED SEDIMENT ON THE DEGREE OF DEPOSITION,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
A. J. Mehta, and E. Partheniades.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 465-476. 4 fig, 8 ref.

Descriptors: *Suspended load, *Sedimentation, *Deposition(Sediments), Settling velocity, Shear stress, Cation exchange, Cohesive soils, Turbulent flow, Hydraulic engineering, Clay minerals, Silts, Physicochemical properties, Hydrodynamics, Flocculation, Saline water.
Identifiers: Attractive forces, Repulsive forces, Brownian motion, Log-normal relationships.

Experimental measurements showed that a given flow can maintain in suspension a constant fraction of a suspended cohesive sediment. In a closed, self-contained flow system, this fraction is represented by the ratio C*sub eq - Csub eq/Csub o, where Csub o is the suspended sediment concentration at the beginning of deposition, and Csub eq is the final steady state concentration. It was found that the ratio 1-C* sub eq, referred to as the degree of deposition, is uniquely related to the bed shear stress, tau sub b, by a logarithmic-normal relaionship. For the different sediment suspensions tested, while the standard deviation, sigma sub y, of the logarithmic-normal relationship remains constant, the geometric mean, (tau*sub b - 1)sub 50, which is the value of (tau*sub b - 1) corresponding to C*sub eq = 0.50, and where tau*sub b = tau sub b/tau sub bmin, is strongly related to the minimum bed shear stress, tau sub bmin, below which all the sediment eventually deposits. Moreover, both (tau*sub b - 1) sub 50 and tau sub bmin appear to be correlated to the Cation Exchange Capacities of the sediments used. (See also W75-05192) (Visocky-ISWS)
W75-05230

SEDIMENT TRANSPORT THROUGH A POROUS COLUMN,
Madras Univ., Guindy (India). Coll. of Engineering.
R. Sakthivadivel.
In: Sediment Transportation, Volume 1; Porceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 477-488. 3 fig, 2 ref.

Descriptors: *Sediment transport, *Porous media, *Particle size, *Groundwater movement, *Interstices, Clogging, Equations, Physical properties, Steady flow, Filters, Confined water, Seepage, Deposition, Flow, Hydraulics, Model studies, Laminar flow.
Identifiers: *Inclined flow, *Equilibrium transport rate.

An experimental investigation of the sediment behaviour when it was transported by a laminar liquid current of constant discharge through a porous column packed regularly with uniform spheres and kept in horizontal or inclined directions was reported. The interactions of the pore size and sediment size in clogging a porous medium and the feasibility of transporting sediment through a porous column were studied. With the concept of a critical tractive stress, an equation for the equilibrium transport rate was derived and verified experimentally. The transport equation is applicable to horizontal flows as well as to those with about 60 degree inclinations. (See also W75-05192) (Prickett-ISWS)
W75-05231

SEDIMENT TRANSPORT RELATIONS USING CONCEPT OF EFFECTIVE SHEAR STRESS,
Regional Engineering Coll., Rourkela (India). Dept. of Applied Mechanics and Hydraulics.
N. Vittal, K. G. Ranga Raju. , and R. J. Garde.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol) Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 489-499, 4 fig, 4 ref.

Descriptors: *Sediment transport, *Sediment load, Analytical techniques, Bed load, Tractive forces, Rivers, Canals, Laboratory tests, Sediment discharge, Alluvial channels, Movement, Particle size, Beds, Ripple marks, Dunes, Flow, Running waters, Analysis, Equations.
Identifiers: River mechanics, Manning-Strickler equation, Movable beds, Plane bed.

Relationships for rates of total load and bed load transport in alluvial streams were developed by using the concept of effective shear stress. For a plane bed unique relationships were shown to exist between the dimensionless shear stress and a dimensionless transport parameter. These relationships, which are different for bed and total loads, were used to define effective shear stresses for ripple and dune beds. It was shown that the effective shear stress for bed load transport is approximately equal to the grain shear stress computed from the Manning-Strickler equation. The effective shear stress for total load transport was found to be greater than the grain shear stress, but related to it. This relationship along with that for total load transport for a plane bed enables computation of total load transport on undulated beds to be made with reasonable accuracy. Published data of measured sediment transport rates in laboratory studies, rivers, and canals were used in the analysis. (See also W75-05192) (Humphreys-ISWS)
W75-05232

BED MATERIAL TRANSPORT IN SAND BED CHANNELS,
Colorado State Univ., Fort Collins. Coll. of Engineering.
K. Mahmood, and D. B. Simons.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 513-524, 5 fig, 8 ref.

Descriptors: *Sediment transport, *Alluvial channels, *Sediment discharge, *Bed load, Suspended load, Bottom sediments, Sands, Streambeds, Theoretical analysis, Laboratory tests, On-site data collections, Equations, Velocity, Profiles, Sediments, Gradation, Particle size, Distribution, Running waters.

A bed material load function was developed for equilibrium flows in sand bed channels. This function was based on an average velocity profile. For graded sand bed materials, the function can be used by dividing the cumulative size distribution curve into fractions of equal probability. The size gradation of the bed material load is, therefore, also obtained. The cumulative gradation curves of total load predicted by the function were very close to those observed in the laboratory. (See also W75-05192) (Humphreys-ISWS)
W75-05233

INVESTIGATION AND COMPUTATION OF SEDIMENT TRANSPORT WITH REGARD TO THEIR DENSITY,
Moskovskii Institut Inzhenerov Zheleznodorozhnogo Transporta (USSR).
For primary bibliographic entry see Field 8B.
W75-05234

SEDIMENT TRANSPORT CHARACTERISTICS OF THE TEESTA RIVER,
Bangladesh Univ. of Engineering and Technology, Dacca. Dept. of Civil Engineering.
M. S. Hossain.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thialand, p 537-546, 8 fig, 5 ref.

Descriptors: *Sediment transport, *Sediment discharge, *On-site data collections, Evaluation, Graphical analysis, Investigations, Bed load, Suspended load, Discharge(Water), Rivers, Analytical techniques, Foreign countries.
Identifiers: River mechanics, *Bangladesh(Teesta River).

The sediment transport characteristics of the Teesta River, a major tributary of the Brahmaputra, were analyzed by using available data from the Bangladesh Water and Power Development Authority. Rating curves in the form of simple power functions for the approximate prediction of total sediment discharge from water discharge were obtained. The simple relations given by Colby for estimating unmeasured sediment discharge and total sediment discharge per unit width of stream from mean velocity of the stream were found in good agreement with the Teesta River data. Results were presented in graphical form. (See also W75-05192) (Humphreys-ISWS)
W75-05235

SEDIMENT DISCHARGE FORMULAE - A COMPARATIVE ANALYSIS,
Central Water and Power Research Station, Poona (India).
C. V. Cole, Z. S. Tarapore, V. N. Kanhere, and J. G. Dixit.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 547-560, 6 fig, 11 ref.

Descriptors: *Sediment discharge, *Equations, *On-site data collections, Estimating, Discharge(Water), Rivers, Analysis, Evaluation, Sediment transport.
Identifiers: *River mechanics, DuBoys-Straub equation, Shields equation, Einstein-Brown equation, Coby equation, Engelund-Hansen equation.

A comparative analysis of the validity of five different sediment discharge formulas was undertaken with respect to prototype data obtained from four streams. The purpose was to determine which of these formulas could be utilized with confidence when an estimate of sediment transport was required for a field study. The analysis was made by determining the goodness of fit for each of the formulas with the Chi-Square test, as well as by examining the standard deviations. The study revealed that the Engelund-Hansen formula gives the least deviation within the range of observed data. As such when a prediction of sediment discharge is required where the flow variables are within the range of data reported, this formula may be used. However, the scatter about this formula does not follow a normal distribution indicating that there might be systematic errors. For extrapolating sediment discharge values beyond the range of observation reported in would be desirable to use the DuBoys-Straub formula which shows a significant goodness of fit with respect to the normal error distribution and at the same time has a reasonably low standard deviation. (See also W75-05192) (Humphreys-ISWS)
W75-05236

SEDIMENT DIFFUSION OVER A WAVY, MOBILE BED,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05237

ON THE CONCEPT OF THE WASH LOAD,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
E. Partheniades.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 573-584. 3 fig, 8 ref. NSF Grant GK-31259.

Descriptors: *Sediment transport, *Suspended load, *Mathematical models, Sediment load, Sediment yield, Particle size, Movement, Channels, Hydrodynamics, Bed load, Stream erosion, Equations, Alluvium, Erosion rates, Cohesionless soils, Cohesive soils, Flow, Entrainment, Statistical methods, Probability.
Identifiers: *River mechanics, Sediment transport capacity, Bed load function.

Existing theories on the erosion and deposition process were critically reviewed and a new model describing the hydrodynamic interaction between a turbulent flow and sediment particles, cohesionless and cohesive, was formulated, which links the behavior of both the wash load and the suspended bed material load. The model explains some important depositional characteristics of fine cohesive sediments revealed by recent research. It was concluded that the wash load consists of three distinct sediment types. The first has a bed load function but its supply rate is less than the sediment transport capacity of the flow. This sediment is expected to be found in the composition of the bed and its supply rates may have an effect on the channel characteristics and the configuration of the bed. The second may have a bed load function for only a limited discharge range, whereas the third type cannot have a bed load function at any flow rate and cannot be found in the composition of an alluvial bed. For this type no sediment transport capacity can exist for any flow. Although the first type agrees most closely with the traditional definition of the wash load, field observations and laboratory experiments suggested that the bulk of the wash load consists of the third type. (See also W75-05192) (Humphreys-ISWS)
W75-05238

STATISTICAL REGULARITIES IN THE MOVEMENT OF BED LOAD,
Research Inst. for Water Resources Development, Budapest (Hungary).
K. Stelczer.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 585-601. 3 fig, 5 tab, 11 ref.

Descriptors: *Sediment transport, *Bed load, *Saltation, *Model studies, Statistical models, Laboratory tests, Cohesionless soils, Gravels, Bed material, Sediments, Statistical methods, Stochastic processes, Probability, Movement, Particle size, Flumes, Evaluation, Distance.
Identifiers: Gamma distribution, Poisson-type distribution.

The parameters describing the movement of bed load are influenced by a number of factors and display a random fluctuation. A particle at any point in the bed remains stationary for a while, then is set into motion, after which it becomes stationary again. Its travel is thus intermittent and the path traveled in a single step may differ from step to step and behave as a random variable. In the laboratory glass flume, the distances traveled by bed load particles from 16 to 40 mm in dimeter and the time spent at rest between successive steps were observed for different bottom slopes. The number of steps during time T was thus also available. Each run was repeated at least 30 times for statistical analysis. The samples were examined for independence and uniformity and the distribution function of distances traveled in individual steps was established to be an exponential one. The probability of the distance traveled in steps was demonstrated to follow a gamma distribution computed from the sum of exponential distributions. The number of steps during time T was approximated by a Poisson-type distribution. (See also W75-05192) (Humphreys-ISWS)
W75-05239

A PROBABILISTIC METHOD FOR DETERMINING THE DISTRIBUTION OF SUSPENDED SOLIDS IN OPEN CHANNELS,
Queens Univ., Kingston (Ontario).
For primary bibliographic entry see Field 8B.
W75-05240

STOCHASTIC MODELS OF SEDIMENT TRANSPORT,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
R. G. Quimpo.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 615-626. 26 ref.

Descriptors: *Statistical models, *Sediment transport, *Reviews, Stochastic processes, Suspended load, Bed load, Sediment discharge, Alluvial channels, Movement, Saltation, Mathematical studies, Equations, Markov processes, Flow characteristics, Boundaries(Surfaces).

To provide a perspective on where modeling might be headed, current stochastic models of sediment transport were reviewed. With a few exceptions, most models incorporate some element of randomness in a basically deterministic analysis to allow for the statistical variability of determinants in the formulation. Two broad classes of models were identified--models of suspended load and models of bed load transport. The genesis of probabilistic models of suspended load was traced to Reynolds' decomposition of the turbulent motion of a fluid and Taylor's statistical theory of diffusion. From these, emanate random walk, Markov, and other stochastic models of sediment particle motion. Current models pave the way for parameters that took the form of empirical constants in earlier models to be broken down into more basic components allowing detailed characterization. Some areas of research need which stand out include the integration of suspended load and bed load models. Traditionally, the tie-up has been effected through the common properties at the interphase defining the bed layer and the shear at the bed. The relation between stochastic measures of boundary and flow properties (e.g., models and statistics of bed form) and the mechanics of flow is another promising field of activity. Prospects in this area are especially encouraging as the linkage which would result points to the eventual unification of deterministic and stochastic models. (See also W75-05192) (Humphreys-ISWS)
W75-05241

SPECTRAL PROPERTIES OF ALLUVIAL BED FORMS IN RIVERS AND FLUMES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05242

EFFECT OF CHARACTERISTICS OF BED MATERIAL AND FLUID ON RIPPLE FORMATION,
Roorkee Univ. (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05243

ON THE CAUSE OF MEANDERING OF RIVERS,
Chuo Univ., Tokyo (Japan). Hydraulic Lab.
T. Hayashi.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 667-678, 7 fig, 6 ref.

Descriptors: *Meanders, *Mathematical studies, *Dunes, Rivers, Alluvial channels, Length, Analytical techniques, Laplaces equation, Flow, Sand waves, Streams, Profiles, River beds, Sediment transport, Scour, Deposition(Sediments), Movement, Erosion, Potential flow.
Identifiers: *River mechanics, Antidunes.

The cause of the initiation of meandering of rivers was analyzed as a problem of three-dimensional stability of the erodible bed. Potential flow was assumed. When the flow was subcritical, the 'unsymmetry' of sediment-transport rate existing with respect to the axes of symmetry of the double-periodic disturbance imposed on the bed plays an essential role in the amplification of the disturbance. When the flow was near-critical or supercritical, the standing alternating seiche waves play an important part in the formation of the alternating antidunes. The regions of occurrence of alternating dunes, flat beds, and alternating antidunes were examined in detail. From this analysis the relationship between the dimensionless meander length and the Froude number was obtained. The predicted meander lengths were compared with published experimental results, the comparison showing a good agreement. Conclusions were: (1) meandering of streams can occur in straight channels even when the side-walls are non-erodible, the meandering in such a case is caused by the development of alternating erosion parts in the river bed; (2) when the flow is subcritical, occurrence of sand waves is caused first by the 'unsymmetry' of sediment-transport rate; and (3) when the flow is supercritical, standing alternating seiche waves play an essential role in the formation of sand waves. The dominant length of alternating antidunes is approximately such that the speed of propagation of the short-crested waves formed by the alternating antidunes equals the undisturbed velocity of flow. (See also W75-05192) (Humphreys-ISWS)
W75-05244

CONDITION FOR THE FORMATION OF ALTERNATE BARS IN STRAIGHT ALLUVIAL CHANNELS,
Waseda Univ., Tokyo (Japan). Dept. of Science and Engineering.
For primary bibliographic entry see Field 8B.
W75-05245

GRAVEL BAR MIGRATION IN STREAMS OF MIDDLE-REACH CHARACTER,
Research Inst. for Water Resources Development, Budapest (Hungary).
O. Gyorke.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 691-702, 3 fig, 4 ref.

Descriptors: *River beds, *Bed load, *Sediment transport, *On-site investigations, Gravels, Sediments, Movement, Cohesionless soils, Aggradation, Degradation(Stream), Beds, Stream erosion, Coarse sediments.
Identifiers: *Hungary(Hernad River), Gravel bars.

The mechanics of bed load transport was reviewed as a background against which gravel bar migration observed and traced over the Hungarian reach of the Hernad River was described. Ideas were presented concerning the principles and methods of regulation on streams with rather flashy regimes, with special regard to the elimination of channel deterioration and inconveniences due to gravel bar migration. (See also W75-05192) (Humphreys- ISWS)
W75-05246

COMPREHENSIVE GRAPHS OF REGIME DATA,
Alberta Univ., Edmonton.
T. Blench, A. W. Peterson, and R. H. Cooper.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 703-714, 3 fig, 19 ref.

Descriptors: *Geomorphology, *Running waters, *Gradients(Streams), *Degradation(Stream), Sedimentation, Sedimentology, Erosion, Streams, Sediment transport, Rivers, Reach(Streams), Regimen.
Identifiers: *Fluvial morphology.

A discussion was given describing a graphical presentation of stream regime data in which average-steady depth and slope have been achieved by the sediment moved by a flow. (See also W75-05192) (Jess-ISWS)
W75-05247

STABLE CHANNELS IN ALLUVIUM,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05248

CHANNEL STABILITY IN RELATION TO BURIED UNCONSOLIDATED SEDIMENTS,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
For primary bibliographic entry see Field 8B.
W75-05249

STABLE CHANNELS IN ALLUVIAL MATERIAL,
Regional Inst. of Tech., Jamshedpur (India). Dept. of Applied Mechanics.
For primary bibliographic entry see Field 8B.
W75-05250

DESIGN OF SCOUR-FREE CHANNELS ON MILD SLOPES,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
For primary bibliographic entry see Field 8B.
W75-05251

SEDIMENT EQUILIBRIUM CONSIDERATIONS IN THE DESIGN OF IRRIGATION CANAL NETWORKS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05252

RIVER-BED VARIATIONS AT CONFLUENCES,
Gifu Univ. (Japan). Dept. of Civil Engineering.
S. Komura.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangko, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 773-784. 7 fig, 1 tab, 8 ref.

Descriptors: *River beds, *Junctions, *Mathematical studies, *Sediment transport, Sediment discharge, Discharge(Water), Equilibrium, Depth, Running waters, Channels, Rivers, Scour, Flow, Subcritical flow, Equations, Continuity equation, Analytical techniques.
Identifiers: *River mechanics, Equation of motion, Movable beds.

An analysis was made of the equilibrium depth of flow at confluences. A general fundamental equation of the equilibrium depth of flow at confluences was obtained by using the equations of motion and continuity for sediment transport, and the equations of continuity and friction velocity

for flowing water, under the assumption that riverbeds above and below the confluence have achieved a dynamic equilibrium state for given water discharges in adjoining channels. By using the fundamental equation for the equilibrium depth of flow, methods of predicting the equilibrium depth of flow at confluences were developed. Regions of occurrence of the equilibrium depth of flow at confluences were described. Field data were used to verify the analytical results. An approximate expression on the relative scour depth was presented. (See also W75-05192) (Humphreys-ISWS)
W75-05253

BED SLOPES OF AGGRADED CHANNELS WITH TWO DEGREES OF FREEDOM,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05254

CONTRIBUTION TO THE STUDY OF GENERAL SCOUR,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Civil Engineering.
J. A. Maza Alvarez, and F. J. E. Alfaro.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 795-803. 3 fig, 8 ref.

Descriptors: *Scour, *River beds, *On-site investigations, Streambeds, Stream erosion, Evaluation, Rivers, Alluvial channels, Running waters, Degradation(Stream), Discharge(Water), Mexico.
Identifiers: River mechanics.

The general scour, which is the lowering that the river bottom undergoes when a flood occurs, is the primary cause of failure of numerous structures constructed in the river beds. The lowering of the river bottom by general scour is more important than the local erosion that endangers the existence of works such as piers, abutments, pipelines, etc. A method to evaluate general scour in river beds formed of sand or gravel was presented. The method was developed from observations on eight bridges, sections in six rivers, and from observations by others. To evaluate the maximum depth to which the river bottom can descend in a section, a recommended formula was given. The maximum scour depth was related to the maximum and average water depths for the dry season, water discharge, river surface width, and grain size distribution of bed materials. (See also W75-05192) (Humphreys-ISWS)
W75-05255

SEDIMENTATION PHENOMENON OF THE FRASER RIVER,
Environmental Protection Service, Ottawa (Ontario). Ecological Protection Branch.
N. Tywoniuk, and W. Stichling.
In: Sediment Transportation, Volume I; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 805-817. 7 fig, 1 tab.

Descriptors: *Rivers, *Sedimentation, *Deposition(Sediments), *Sediment transport, *Tidal streams, *Tidal effects, River basins, Erosion, Scour, Stream erosion, Channel erosion, *Canada, Bed load, River beds, Dredging, River training.
Identifiers: *Lower Fraser River(Canada).

A comprehensive hydrometric and sediment survey was started on the Lower Fraser River in 1965. Daily tidal fluctuations up to 10 feet, variations and reversals in river flows, and the relatively large river depths, widths (2000 feet to 3 miles), and velocities resulted in deviation from standard survey techniques. In the analysis of data, consideration was given to the time and space variations of flow and sediment discharge. In the unsteady flow or tidal regions, the flow and sediment transport phenomenon were investigated on an hourly basis; in the upper reaches, the mean daily data could be reliably interpreted. The longitudinal space variations were determined by means of a sediment balance. The seasonal variations in particle size distributions for both the suspended sediment and the bed load were found to be quite significant. Results of dredged and measured quantities indicated that more coarse material was dredged than was transported by the river to the dredging region. (See also W75-05192) (Sanderson-ISWS)
W75-05256

THE HISTORY OF SEDIMENT YIELD AND DEPOSITION OF THE JUBONES RIVER, ECUADOR, AND ITS RELATION TO ENGINEERING PROJECTS,
R. J. Maddrell.
In: Sediment Transportation, Volume I; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 819-829. 5 fig, 6 ref.

Descriptors: Rivers, *Sedimentation, *Stream stabilization, *Sediment transport, *River training, *Deposition(Sediments), *River basins, Erosion, Scour, Stream erosion, Channel erosion, Flood control, River beds, River regulation, Coastal plains, Embankments, Irrigation, History.
Identifiers: *Ecuador(Jubones River).

An engineering study of the Jubones River, undertaken in order to formulate recommendations for the development of a province, involved the investigation of flood protection, irrigation, and hydro-electric development. Generally, the river carries heavy sediment loads and the combination of heavy seasonal rainfall, flood flows, and sediment caused flooding in large areas of the coastal plain damaging or destroying bananas and other crops. In the past, numerous major changes in the course of the river nullified large stretches of the surface irrigation system. The course of the river was most recently changed in May 1970. These changes in the river's course do not appear to be haphazard, but are brought about by the accretion of the river bed and the building of a delta. The instability of the path of the river across the coastal plain shows that the control of the river cannot be achieved by attempting to confine the river to its present course, as this would be an attempt to hold back evolution. Such an attempt would involve continual vigilance and increasing maintenance costs, and the chances of a serious mishap occuring would increase with time, threatening not only the industry of the coastal plain, but the very existence of a major port. In the future, with regular surveys, a greater knowledge of the river, and bold planning, it should be possible to assist the river to evolve in its own way. The establishment of trials to examine the best method of assisting the river to establish a more stable regime was a key part of the engineering proposals. (See also W75-05192) (Sanderson-ISWS)
W75-05257

SCOURING CAPACITY OF FLOW IN NARROW OPEN CHANNELS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 8B.
W75-05258

BED-CHANGE PROCESSES IN A SAND-BEARING RIVER,
Research Inst. for Water Resources Development, Budapest (Hungary).
I. Laczay.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 841-849. 5 fig, 1 tab.

Descriptors: *Surveys, *River beds, *On-site investigations, *Channel morphology, Regime, Sediment transport, Bed load, Profiles, Suspended solids, Sampling, Evaluation, River flow, Streambeds, Discharge(Water), Alluvial channels, Aggradation, Degradation(Stream), Stream erosion, Data collections.
Identifiers: *Hungary(Drava River).

A 6-km long reach of the Drava River was studied for 4 years by repeated surveys of selected bed-profiles, sediment sampling of bed-load, bed-material, and suspended sediment, and measurements of discharge and water surface slope. The objective of the investigations was to collect data and information necessary for a river training project. During this period an oscillation of bed-level of several meters was observed. The net bed-material balance of the river reach was surpassed several times by the amount of bed-material which was only rearranged within the reach. The amount rearranged within the reach did not show significant decrease even during low-flow periods. Thus, a certain amount of the total energy of the flow might be continuously consumed by the process of the bed-rearrangement and assumed to be almost independent of the variations in sediment transporting capacity, i.e., of the net bed-material balance. It was concluded that the sediment regime of the study reach is in a state of the long-term equilibrium. Channel bed volume changes determined from four surveys made during the period 1968-1971 were tabulated. (See also W75-05192) (Humphreys-ISWS)
W75-05259

PREDICTION OF SUBSOIL ERODIBILITY USING CHEMICAL, MINERALOGICAL AND PHYSICAL PARAMETERS,
Purdue Research Foundation, Lafayette, Ind.
C. B. Roth, D. W. Nelson, and J. M. Romkens.
For sale by the Superintendent of Printing , Office, Washington, D.C. 20402. $1.90. Environmental Protection Agency, Technology Series, Report EPA-660/2-74-043, June 1974. 111p, 55 fig, 17 tab, 17 ref, 3 append. 1BB042 EPA Project.

Descriptors: Agronomy, Agricultural engineering, Aluminum, Inorganic compounds, Clay minerals, Erosion control, Iron compounds, Regression analysis, Silicates, Soil erosion, Soil aggregates, Soil analysis, Soil structure.

Evidence is presented that the surface soil erodibility prediction nomography which uses terms involving soil particle size, organic matter, structure and permeability, could not be improved upon by consideration of other mineralogical and chemical parameters. However, the surface soil erodibility nomograph did not adequately preict the soil erodibility factor, K, of high clay subsoils studied in the field under simulated rainfall conditions. A multiple linear regression equation and nomograph were developed which can be used to estimate the erodibility factor, K, of many hihg clay subsoils. The subsoil erodibility factor, K, of many high clay subsoils. The subsoil erodibility nomograph uses terms involving soil particle size distribution and the amount of amorphous hydrous oxides or iron, aluminum, and silicon in the soil. Multiple regression analysis revealed that amorphous iron, aluminum and silicon hydrous oxides serve as soil stabilizers in subsoils, whereas, organic matter is the major stabilizer in surface soils. Soil erodibility from seim-compacted fill and scalped subsoil surface surface conditions were essentially identical. The scalped condition is best standard soil surface to base the caluclation of the erodibility factor for subsoils. A soil-management factor should replace

the cropping-management factor in the Universal-Soil-Loss Equation when the Equation is used to predict subsoil erosion. (EPA) (See W71-13910)
W75-05308

AN EXECUTIVE SUMMARY OF THREE EPA DEMONSTRATION PROGRAMS IN EROSION AND SEDIMENT CONTROL,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W75-05310

PROGRAMMED DEMONSTRATION FOR EROSION AND SEDIMENT CONTROL SPECIALISTS,
Hittman Associates, Inc., Columbia, Md. Environmental and Geosciences Dept.
For primary bibliographic entry see Field 5G.
W75-05311

DEMONSTRATION OF THE SEPARATION AND DISPOSAL OF CONCENTRATED SEDIMENTS,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W75-05312

BENTHIC ANIMAL-SEDIMENT,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5A.
W75-05343

2K. Chemical Processes

INTERLABORATORY QUALITY CONTROL STUDY NO 6: SPECIFIC CONDUCTANCE, PH, COLOUR AND RESIDUE,
Canada Centre for Inland Waters, Burlington (Ontario).
D. J. McGirr.
Canada Centre for Inland Waters, Report No 28, 1974, 6 p, 4 ref, 5 tab, append.

Descriptors: *Water analysis, *Laboratory tests, Water chemistry, Testing procedures, Analytical techniques, Sampling, Hydrogen ion concentration, Color, Evaluation, Measurement, *Pollutant identification.
Identifiers: *Accuracy, Conductance, Residue, Residue determination.

Three synthetic samples and two filtered natural samples were sent to eighteen participating laboratories for the determination of specific conductance, pH, color and filterable residue. The pH of the natural samples was determined with a standard deviation of 0.3-0.5 pH units, which is distinctly higher than the value of about 0.1 pH units which is found for buffered synthetic samples. The precision of the color measurements was fair, as would be expected for the visual method used. Generally good precision was obtained for specific conductance using the conductivity meter. Results for residue were surprisingly poor on the synthetic samples but satisfactory on the natural samples. It appeared that weighing difficulties were an important problem in residue determination. (Environment Canada)
W75-04887

FURTHER STUDIES ON THE HEAVY METAL LEVELS IN OTTAWA AND RIDEAU RIVER SEDIMENTS,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W75-04890

THE GEOCHEMISTRY OF CERTAIN MINE AND SPRING WATERS, WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 5B.
W75-04938

WATER AND AQUEOUS SOLUTIONS: INTRODUCTION TO A MOLECULAR THEORY,
Hebrew Univ., Jerusalem (Israel). Inst. of Chemistry.
For primary bibliographic entry see Field 1B.
W75-04970

WEATHERING OF OIL AT SEA,
Esso Research and Engineering Co., Linden, N.J. Government Research Div.
For primary bibliographic entry see Field 5B.
W75-05106

GROUNDWATER IN PERMAFROST REGIONS OF CANADA,
Department of the Environment, Calgary (Alberta). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W75-05150

HYDROGEOLOGY OF THE LETHBRIDGE-FERNIE AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-05151

REGIONAL CHEMISTRY AND WATER LEVEL DISTRIBUTION OF THE NEAR-SURFACE GROUNDWATERS OF THE EDMONTON AREA (NORTHWEST SEGMENT), ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-05152

HYDROGEOCHEMISTRY OF CARBONATE GROUNDWATERS OF AN URBAN AREA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2F.
W75-05163

AMORPHOUS SOLID WATER: A NEUTRON DIFFRACTION STUDY,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 1B.
W75-05169

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPERS AND CYANIDE COMPLEXING,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5A.
W75-05274

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPERS AND CYANIDE COMPLEXING,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5A.
W75-05275

2L. Estuaries

ESTABLISHMENT OF OPERATIONAL GUIDELINES FOR TEXAS COASTAL ZONE MANAGEMENT: INTERIM REPORT ON RESOURCE CAPABILITY,
Texas Univ. at Austin.
E. G. Fruh, W. L. Fisher, K. Haynes, J. E. Hazleton, and J. F. Malina.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 975, $8.50 paper copy, $2.25 microfiche. Prepared for: National Science Foundation, Washington, D.C. Interim report. May, 1973. 249 p, 37 tab, 39 fig, 46 ref. GI-34870X.

Descriptors: *Coastal engineering, *Gulf Coastal Plain, *Areal hydrogeology, Geology, *Geologic investigations, *Coasts, *Natural resources, *Coastal structures, *Soils, Soil analysis, Groundwater, Flood plains, Regional planning, Barrier islands, Land use, Zoning, Aquifers, Management, *Texas, Engineering, Soil classification, Physical properties.
Identifiers: Nueces County(Tex), San Patricio County(Tex), Aransas County(Tex), Refugio County(Tex), Corpus Christi area(Tex).

For effective coastal zone management in Nueces, San Patricio, Refugio, and Aransas Counties of south Texas a comprehensive catalogue of environmental data has been compiled. The environmental effects of man's current activities, future activities, and potential management policies in the area can all be understood better with these guidelines. To examine the geology, soils, biology, hydrology, physical and chemical properties, and natural processes involved, forty categories of capability units are analyzed, mapped, and catalogued. Capability units are environmental entities -- land, water, or biota -- defined in terms of the kind and degree of activity or use they can withstand without degrading the environment beyond acceptable levels. Physical, process, man-made, and water units in the following categories are described: Coastal Plain; Flood Plain; Barrier Islands; Wetlands; Man-made Features; Bays, Lagoons, Estuaries, and Open Gulf; Active and Potentially Active Faults. The land capability units are subjected to standard engineering studies, including foundation strength and shrink-swell analysis. The potentiometric surface (ground water surface) is mapped from well data and dynamics of ground water movement are explored. Finally, each capability unit is described. Limiting factors, beneficial uses, and detrimental uses are outlined. A taxonomy showing the relationship of capability units to human activities (construction, waste disposal, and agriculture) is presented to aid in future coastal zone management. (Herr-North Carolina)
W75-04851

DIGITAL SIMULATION OF HORIZONTAL SALT-WATER ENCROACHMENT INDUCED BY FRESH-WATER PUMPING,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vanden Berg.
Scientific Series, No 41, Ottawa, Ontario, 1974. 27 p, 17 ref, 23 fig, 6 tables.

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Encroachment, Groundwater, Model studies, Analytical techniques, Pumping, Seepage, Hydrology, Aquifer characteristics, Wells, Mathematical models.
Identifiers: *Coastal aquifers, Hydraulic conductivity.

The horizontal movement of salt water into a coastal aquifer can be determined if the piezometric-head distribution and the hydrologic characteristics of the aquifer are known and if the density difference between fresh and salt water is ignored.

The calculation of the time-variant head distribution in a nonhomogeneous horizontal aquifer of irregular shape by the alternating direction implicit procedure (ADIP) is reviewed, and modifications to the basic procedure are introduced. The procedure is tested against analytical solutions for aquifers of various shapes, and for continuous as well as discontinuous variations of the transmissivity. In all the tests the numerical and analytical solutions agreed to within 2% and more commonly to within 1%. When a pumping well, however, was involved the error at the nodes adjacent to the well could be as large as 6%, depending on the mesh size of the finite-difference grid. (Environment Canada)
W75-04875

DELINEATION OF GREAT LAKES ESTUARIES,
Ohio River Valley Sanitation Commission, Cincinnati.
For primary bibliographic entry see Field 2H.
W75-04912

ROOKERY BAY LAND USE STUDIES, THE RESOURCE BUFFER PLAN: A CONCEPTUAL LAND USE STUDY,
Miami Univ., Fla. Center for Urban Studies.
For primary bibliographic entry see Field 4A.
W75-04929

ESTIMATION OF HEAVY METAL POLLUTION IN TWO NORWEGIAN FJORD AREAS BY ANALYSIS OF THE BROWN ALGA ASCOPHYLLUM NODOSUM,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
For primary bibliographic entry see Field 5A.
W75-05002

IMPACT OF PESTICIDES ON PHYTOPLANKTON IN EVERGLADES ESTUARIES,
Florida State Univ., Tallahassee.
For primary bibliographic entry see Field 5C.
W75-05005

HARMONIC FUNCTIONS FOR SEA-SURFACE TEMPERATURES AND SALINITIES, KOKO HEAD, OAHU, 1956-69, AND SEA-SURFACE TEMPERATURES, CHRISTMAS ISLAND, 1954-69,
National Marine Fisheries Service, Monterey, Calif. Environmental and Fishery Forecasting Center.
G. R. Seckel, and M. Y. Y. Young.
Fishery Bulletin, Vol 69, No 1, p 181-214, 1971. 7 fig, 8 tab, 10 ref.

Descriptors: *Mathematical studies, *Temperature, *Sea water, *Salinity, *Hawaii, Surface waters, Fourier analysis, Pacific Ocean.
Identifiers: *Harmonic function, *Koko Head(Oahu), *Christmas Island.

Harmonic functions are presented of sea-surface temperatures and salinities regularly measured near Koko Head, Oahu during 1956-1969 and at Christmas Island during 1954-1969. Sea-surface temperatures and salinities change in response to, and therefore reflect, sea-air interaction processes (heat exchange, evaporation minus precipitation) and oceanographic processes (advection, diffusion). The manner in which Fourier analysis has been adapted to this application is described. The standard errors of estimate for Koko Head temperatures and salinities are less than .26C and less than 0.05 salinity, respectively. The standard errors of estimate for Christmas Island temperatures are approximately 60% above those for the Koko Head temperature. The expected values of Koko Head temperature and salinity functions have an uncertainty of plus or minus 0.1C and plus or minus 0.015 salinity, respectively, when samples were obtained semiweekly. Error terms of the Christmas Island temperatures, with daily sampling, are on average 0.07C. Harmonic analysis spanning the entire sampling duration shows that long-term variations in the Christmas Island temperature and Koko Head salinity are larger than the seasonal variations. Seasonal variations in the Koko Head temperatures are dominant and longer term variations small. Results of the harmonic analyses are presented. (See also W75-05016) (Jones-Wisconsin)
W75-05026

PRIMARY, PHYSICAL IMPACTS OF OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5C.
W75-05032

A GUIDE TO THE MEASUREMENT OF MARINE PRIMARY PRODUCTION UNDER SOME SPECIAL CONDITIONS,
United Nations Educational, Scientific and Cultural Organization, Paris(France).
For primary bibliographic entry see Field 5A.
W75-05047

REMOTE SENSING AS AN AID FOR MARSH MANAGEMENT - LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W75-05095

OIL CONTAMINATED BEACH CLEANUP,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 5G.
W75-05100

WATERBORNE DEBRIS IN MARINE POLLUTION INCIDENTS,
Battelle Columbus Labs., Long Beach, Calif. Long Beach Research Facility.
For primary bibliographic entry see Field 5B.
W75-05114

THE USE OF COLOR INFRARED AERIAL PHOTOGRAPHY IN DETERMINING SALT MARSH VEGETATION AND DELIMITING MAN-MADE STRUCTURES OF LYNNHAVEN BAY, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Dept. of Biology.
R. E. Holman, III.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-31855, $4.25 in paper copy, $2.25 in microfiche. Report No. NASA CR-62099, June 1974. 47 p, 15 fig, 9 tab, 38 ref. NASA Grant No. NGL-47-003-067.

Descriptors: *Remote sensing, *Virginia, *Salt marshes, *Aerial photography, Coastal marshes, Ecology, On-site investigations, Wetlands, *Vegetation, Infrared radiation, Analytical techniques, *Estuarine environment.
Identifiers: *Lynnhaven Bay(Va).

Color infrared aerial photography was found to be superior to color aerial photography in an ecological study of Lynnhaven Bay, Virginia. The research was divided into three phases: (1) determination of the feasibility of correlating color infrared aerial photography with saline wetland species composition and zonation patterns, (2) determination of the accuracy of the aerial interpretation and problems related to the aerial method used, and (3) comparison of developed with undeveloped areas along Lynnhaven Bay's shoreline. Wetland species composition and plant community zonation bands were compared with aerial infrared photography and resulted in a high degree of correlation. Problems existed with changing physical conditions, such as time of day, aircraft angle, and sun angle, making it necessary to use several different characteristics in wetland species identification. The main characteristics used were known zonation patterns, textural signatures, and color tones. Lynnhaven Bay's shoreline was 61.5% developed. (Sims-ISWS)
W75-05126

SOFAR CHANNEL AXIAL SOUND SPEED AND DEPTH IN THE ATLANTIC OCEAN,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 8B.
W75-05156

MEAN LENGTH OF RUNS OF OCEAN WAVES,
Chicago Bridge and Iron Co., Planfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W75-05160

SOURCES AND TRENDS IN WASTE WATER LOADINGS TO THE SAN FRANCISCO BAY REGION,
Sir George Williams Univ., Montreal (Quebec). Dept. of Economics.
For primary bibliographic entry see Field 5B.
W75-05186

CHANNEL STABILITY IN RELATION TO BURIED UNCONSOLIDATED SEDIMENTS,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
For primary bibliographic entry see Field 8B.
W75-05249

ARSENIC DISTRIBUTION IN WATERS AND SEDIMENTS OF THE PUGET SOUND REGION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-05294

LATERALLY INTEGRATED NUMERICAL WATER QUALITY MODEL FOR AN ESTUARY,
Rhode Island Univ., Kingston. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-05323

MINIMUM INTERFERENCE BETWEEN PLANKTON SPECIES AND ITS BENEFICIAL EFFECT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W75-05338

ECOLOGICAL EFFECTS OF NUCLEAR STEAM ELECTRIC STATION OPERATIONS ON ESTUARINE SYSTEMS, VOL. 2.
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05342

BENTHIC ANIMAL-SEDIMENT,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5A.
W75-05343

BLUE CRAB SURVEY IN THE WATERS ADJACENT TO THE CALVERT CLIFFS

NUCLEAR STEAM ELECTRIC STATION AND THE CHESAPEAKE BAY REGION,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05344

FISH SURVEY: OTHER TRAWL COLLECTIONS OFFSHORE OF THE CALVERT CLIFFS NUCLEAR POWERPLANT SITE,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05345

ECOSYSTEM MODELING: EFFECTS OF TEMPERATURE ON ESTUARINE MICROCOSMS,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05346

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FRACTIONATION OF SPENT SULFITE LIQUORS USING ULTRAFILTRATION CELLULOSE ACETATE MEMBRANES,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W75-04975

EVALUATION OF NEW REVERSE OSMOSIS MEMBRANES FOR THE SEPARATION OF TOXIC COMPOUNDS FROM WASTEWATER,
Illinois Univ., Urbana. Environmental Engineering Program.
For primary bibliographic entry see Field 5D.
W75-04988

MECHANISMS OF BRINE-SIDE MASS TRANSFER IN A HORIZONTAL REVERSE OSMOSIS TUBULAR MEMBRANE,
Clarkson Coll. of Technology, Potsdam, N.Y.
L. J. Derzansky, and W. N. Gill.
American Institute of Chemical Engineers Journal, Vol 20, No 4, p 751-761, July 1974. 8 fig, 3 tab, 37 ref.

Descriptors: *Reverse osmosis, *Convection, *Laminar flow, Reynolds number, *Desalination, Buoyancy, Membranes, Mass transfer.
Identifiers: Concentration polarization, Rayleigh number, Deissler analogy, Leveque model, Peclet number, Sherwood number, Schmidt number.

The desalination performance of a tubular reverse osmosis membrane was studied. Measurements of local mass transfer rates were made at sixteen locations along the tube length for laminar and turbulent flows. The dominant transport mechanisms in laminar flow are forced convection upstream and combined free and forced convection downstream. After a distance of about 16 diameters, system behavior controlled by combined free and forced convection proved insensitive to Reynolds number and axial distance. Correlations in terms of the Rayleigh number Ra agreed better with the data of other tests--this suggests that previous design methods may give conservative predictions of performance, as they neglect mass transfer enhancement due to ubiquitous buoyancy effects. (Carpenter-FIRL)
W75-04989

NEW MEMBRANES FOR REVERSE OSMOSIS TREATMENT OF METAL FINISHING EFFLUENTS,
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5D.
W75-05089

3B. Water Yield Improvement

A REVIEW OF FISHERIES MINIMUM FLOW METHODOLOGIES FROM THE VIEWPOINT OF WATER AVAILABILITY,
Washington State Dept. of Ecology, Olympia.
R. T. Milhous.
Presented at the 1973 National Conference of the American Water Resources Association, Seattle, Washington, October 22-24, 1973. 13 p, 7 fig, 3 tab, 6 ref.

Descriptors: *Fisheries, *Flow rates, *Water allocation(Policy), *Washington, *Low flow, Fish conservation, Fish management, Water utilization.
Identifiers: *Water availability.

One of the requirements in the development of a water resources program for the State of Washington is that flows in perennial rivers and streams shall be adequate to preserve environmental values with the remaining water allocation on the basis of maximum net benefits. In order to establish minimum flows for fish, methodologies have been developed in Oregon, Montana, and Washington which estimate the minimum flows required to (1) preserve, and (2) maintain at an optimum level, the fisheries habitat of streams. These methods have been reviewed from the viewpoint of the water available, naturally, to satisfy the calculated minimum flows. It was found that the various methods tend to result in rearing flows considerably in excess of the water naturally available. In general, the methods developed to estimate the flows required to maintain a fishery in the streams result in flow requirements in excess of the water naturally available. These methods need to be improved before they can be used in a management program which requires that preservation flows be known. (Poertner)
W75-04861

PRECIPITATION MECHANISMS IN SUMMERTIME CONVECTIVE CLOUDS,
Meteorology Research, Inc., Altadena, Calif.
T. B. Smith, D. M. Takeuchi, and C. W. Chien.
Available fromthe National Technical Information Service, Springfield, Va 22161 as PB-235 326, $5.25 in paper copy, $2.25 in microfiche. Arizona Weather Modification Research Program Report No. REC 14-06-D-6581, February 28, 1974. 144 p, 1 tab, 23 ref, 4 append. Contract No. 14-06-D-6581.

Descriptors: *Weather modification, *Cloud seeding, *Cloud physics, *Computer models, Atmospheric physics, Precipitation(Atmospheric), Meteorology, Optimization, Decision making, *Arizona, Clouds, Model studies.
Identifiers: Project skywater, Flagstaff(Ariz), Mesoscale convective systems.

Optimization procedures were developed and techniques for promoting mesoscale organization of convective systems. Optimization procedures required a more detailed physical understanding of the microphysical processes occurring in natural and seeded clouds. Several microphysics models were developed to permit computer simulation of these processes. Much time and effort was devoted to acquisition and analysis of observational data for comparison with model calculations. Development of techniques for the rapid assimilation of synoptic weather data for the purposes of treatment decision-making was considered to be a part of the problem of developing optimization procedures. An attempt was made to bring order into the field of steady-state cumulus models by summarizing and comparing key aspects of the models currently in use. The climatological seedability study, based on a relatively crude model of convective clouds, needs to be used with caution, particularly in regard to quantitative results. These results probably depict most accurately the conditions at Flagstaff where the model was originally developed. The results suggest that the potential for dynamic seeding tends to be greater within the southern tier of states (Arizona to Texas). This is likely to be the result of more frequent stable layers aloft than usually occur in the northern areas. Heat released by the seeding then has a more frequent opportunity for stimulating further growth. Aside from this generality, the study is valuable for suggesting the potential use of cloud models and for indicating that important areal variations in seedability may exist. (Jones-ISWS)
W75-05111

WEATHER MODIFICATION-RELATE UNCERTAINTIES IN ECOLOGICAL AND AGRICULTURAL SYSTEMS IN THE HIGH PLAINS: SCIENTIFIC APPRAISAL AND RECOMMENDED RESEARCH,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
F. M. Smith, F. F. Calhoun, B. D. Church, J. E. Fletcher, and J. E. Johnson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 033, $6.25 in paper copy, $2.25 in microfiche. Bureau of Reclamation, Denver, Colorado, Report No. 14-06-D-7519, July 31, 1974. 153 p, 6 fig, 1 tab, 70 ref, 9 append. 14-06-D-7519.

Descriptors: *Weather modification, *Cloud seeding, *Ecology, *Agriculture, Hydrology, Forages, Cost-benefit ratio, Livestock, Temperature, Precipitation(Atmospheric), Evaporation, Crops, Insects, Phenology, Population, Economics, Social aspects, Model studies, Cultures, Plant populations, Land use, Pathology, Natural resources.
Identifiers: *High plains, Game species, Endangered species.

A multidisciplinary appraisal was performed of weather modification-related uncertainties in ecological and agricultural systems in the High Plains with respect to a 5 to 7 year weather modification experiment. The ecological and agricultural systems were regarded as being causally coupled with the hydrologic and seeding agent systems and directly coupled with economic and social systems. The recommendations for conducting a 5 to 7 year program included: an overall scientific plan; awarding the prime contract to a central coordinating group of scientists; selecting a soil water balance model, a simulation model of land use, a livestock production model, and a comprehensive cost-benefit analysis model; studying the response of major plant pathogens to weather modification; surveying public attitudes; coordinating public information from the precipitation enhancement and hail suppression programs; and inventorying existing background agents, the convening of a national workshop on the impacts of seeding agents, study of the progress of seeding agents through physical and ecological systems, and endangered species. (Jones-ISWS)
W75-05118

JEMEZ ATMOSPHERIC WATER RESOURCES RESEARCH PROJECT, VOLUME I: SUMMARY AND ACCOMPLISHMENTS,
New Mexico State Univ., University Park. Engineering Experiment Station.
C. G. Keyes, Jr., F. D. Stover, J. V. Lunsford, and M. Lentner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 005, $4.25 in paper copy, $2.25 in microfiche. Bureau of Reclamation, Denver, Colorado, Report No. REC 14-06-D-6803, January 1974. 53 p, 4 fig, 3 tab, 25 ref, 1 append. Contract No. 14-06-D-6803.

Descriptors: *Cloud seeding, *Weather modification, *Meteorology, *Precipitation(Atmospheric), Data processing, Statistical methods, Snowfall, Winds, Storms, *New Mexico, Data collections, Precipitation gages, Weather forecasting, Summer, Winter, Orography.
Identifiers: *Jemez Mountains(N Mex).

The different schemes used for the evaluation of the randomized winter cloud seeding in the Jemez Mountain immediate target area were given. The relative crude methods of evaluation that indicated beneficial results were: preliminary nonstatistical evaluation scheme, refined preliminary nonstatistical evaluation scheme, isohyeti examination of seeding effect, double ratio scheme, and the diurnal precipitation patterns versus seeding scheme. The 'meteorological partitioning technique' used in conjunction with the nonparametric statistical analysis indicated specific meteorological conditions associated with probable increases and decreases in precipitation while seeding the wintertime storms that crossed the research area during 1968 through 1972. Recommendations for additional evaluation of the Jemez data set were included that could benefit any future winter cloud seeding program, whether experimental, pilot, or operational. (See also W75-05122) (Jones-ISWS)
W75-05121

JEMEZ ATMOSPHERIC WATER RESOURCES RESEARCH PROJECT, VOLUME II: SPECIAL ASPECTS OF THE PROGRAM,
New Mexico State Univ., University Park. Engineering Experiment Station.
C. G. Keyes, Jr., F. D. Stover, J. V. Lunsford, and M. Lentner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 006, $5.75 in paper copy, $2.25 in microfiche. Bureau of Reclamation, Denver, Colorado, Report No. REC 14-06-D-6803-2, December 1973. 130 p, 19 fig, 14 tab, 59 ref, 5 append. Contract No. 14-06-D-6803.

Descriptors: *Cloud seeding, *Weather modification, *Meteorology, *Precipitation(Atmospheric), Data processing, Statistical methods, Snowfall, Winds, Storms, *New Mexico, Data collections, Precipitation gages, Weather forecasting, Summer, Winter, Orography.
Identifiers: *Jemez Mountains(N Mex).

Scientific studies on precipitation augmentation in the Jemez Mountains of northern New Mexico were conducted during the period 1 July 1969 to 31 September 1973. The studies included the operation of a mesoscale observation network, evaluation of randomized seeding, and physical interpretation of the results of the 6-hour analysis unit. Preliminary studies were made of downwind effects. The conclusions of the study were presented in Volume 1. (See also W75-05121) (Jones-ISWS)
W75-05122

A PILOT PROJECT OF WEATHER MODIFICATION FOR THE SAN JUAN MOUNTAINS OF THE COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
L. O. Grant, C. F. Chappel, L. W. Crow, J. M. Fritsch, and P. W. Mielke, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 085, $4.75 in paper copy, $2.25 in microfiche. Final Report, February 1974. 64 p, 11 fig, 5 tab, 59 ref, 9 append. BuRec Contract 14-06-D-6467.

Descriptors: *Artificial precipitation, *Orography, Cloud seeding, Snowpacks, Weather modification, Design, *Colorado River Basin, Data collections, Evaluation.
Identifiers: Precipitation augmentation.

A design program was prepared to apply results from experimental programs for augmenting orographic precipitation to a pilot project that would have the goal of providing sound scientific and engineering evaluation of precipitation increases over a large area by operational-type application of cloud seeding techniques. Described were: (1) the purpose of the project, (2) the scientific and technological basis, (3) the design constraints, and (4) the details of the design. The design itself includes descriptions of: (1) experimental hypothesis; (2) site selection; (3) experimental procedures (randomization, etc.); (4) data collection requirements; (5) operations procedures; and (6) evaluation techniques to be employed. (Jones-ISWS)
W75-05127

AIR PRESSURES OVER SURFACES EXPOSED TO WIND - I. WATER HARVESTING CATCHMENTS,
Agricultural Research Service, Water Conservation Lab. Phoenix, Ariz.
A. R. Dedrick.
Transactions of the American Society of Agricultural Engineers, Vol 17, No 5, p 917-921, September-October 1974. 6 fig, 13 ref.

Descriptors: *Water harvesting, *Watersheds(Basins), *Wind pressure, Water conservation, Winds, Turbulence, Air, Air circulation, Model studies.
Identifiers: Air pressure.

The magnitude and location of wind forces over unprotected water harvesting catchment aprons constructed of exposed flexible membrane liners were determined by the use of models in a wind tunnel. Geometric factors studied included two berm configurations and four breadth to berm-height ratios. Pressure distributions over water-catchment aprons were independent of breadth to berm-height ratios of 50 or more. Negative pressures were three times lower over gradually sloped catchment berms than over sine-shaped berms. Each berm shape, on the leeward side of the upwind berm, had an associated pressure distribution that was independent of shape but varied in magnitude depending on the shape of the windward side of the berm. Pressures were not as extremely negative on the leeward side of the berm when the windward side was gradually sloped rather than sine-shaped. Pressures were near zero to slightly positive over a large part of the water-catchment apron between the berm toes. (Jess-ISWS)
W75-05179

WAMIS--A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT,
Arizona Unov., Tuscon. Dept. of Watershed Management.
For primary bibliographic entry see Field 10A.
W75-05302

A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 10A.
W75-05303

3C. Use Of Water Of Impaired Quality

WATER QUALITY OF THREE SMALL WATERSHEDS IN NORTHERN UTAH,
Forest Service (USDA), Logan, Utah. Forest Sciences Lab.
For primary bibliographic entry see Field 5B.
W75-04943

CALCULATION OF CONCENTRATION OF IMPURITIES IN THE RECYCLING SYSTEM OF PROCESS WATER IN KRAFT PULP MANUFACTURE (BERECHNUNG DER VERUNREINIGUNGSKONZENTRATION IM REZIRKULATIONS SYSTEM DER BETRIEBSWAESSER BEI DER SULFATZELLSTOFFHERSTELLUNG),
IRAPA, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W75-04959

WATER RECYCLING IN THE MANUFACTURE OF SIZED PAPERS (ISPOL'ZOVANIE OBOROTNYKH VOD V PROIZVODSTVE KLEENYKH VIDOV BUMAGI),
Belorusskii Tekhologicheskii Institut, Minsk (USSR).
For primary bibliographic entry see Field 5D.
W75-04960

NITRATE AND CHLORIDE MOVEMENT IN THE PLAINFIELD LOAMY SAND UNDER INTENSIVE IRRIGATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W75-04997

EVALUATION OF DRAINAGE FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-05090

3D. Conservation In Domestic and Municipal Use

FLOOD ESTIMATION FOR URBAN AND RURAL CATCHMENTS,
Snowy Mountains Engineering Corp., Cooma (Australia). Hydrology Branch.
For primary bibliographic entry see Field 4A.
W75-04856

AGRICULTURAL LAND USE IN THE POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-05260

3E. Conservation In Industry

TRAINING MANUAL ON THE BASIC TECHNOLOGY OF THE PULP AND PAPER INDUSTRY AND ITS WASTE REDUCTION PRACTICES,
Lakehead Univ., Thunder Bay (Ontario).
For primary bibliographic entry see Field 5D.
W75-04871

CHELANT TREATMENTS PROVIDE MAXIMUM RETURN TO THE PULP AND PAPER INDUSTRY,
Betz Lab., Inc., Trevose, Pa.
For primary bibliographic entry see Field 5F.
W75-04940

EFFLUENT TOXICITY REMOVAL ON THE WEST COAST,
B.C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W75-04942

EXPECTATIONS FOR THE CLOSED WATER SYSTEM AND COST COMPARISON WITH EF-

FLUENT PURIFICATION (DIE ERWARTUNGEN AND DEN GESCHLOSSENEN WASSERKREISLAUF IM KOSTENVERGLEICH ZUR ABWASSERREINIGUNG),
Krofta Apparatebau (Gesellschaft) (West Germany).
For primary bibliographic entry see Field 5D.
W75-04944

SYSTEM CLOSURE IN RHEMSPRINGE (KREISLAUFSCHLIESSUNG IN RHUMSPRINGE),
Harzer Papierfabrik Sievers G.m.b.H. and Co. KG, Rhumspringe (West Germany).
For primary bibliographic entry see Field 5D.
W75-04947

ENVIRONMENTAL PROTECTION IN THE FINNISH PULP AND PAPER INDUSTRY (UMWELTSCHUTZ IN DER FINNISCHEN ZELLSTOFF- UND PAPIERINDUSTRIE),
Finnish Pulp and Paper Research Inst., Helsinki.
For primary bibliographic entry see Field 5G.
W75-04949

INTRODUCTION OF THE ATTISHOLZ PROCESS INTO PAPER MILLS AND SOME RESULTING EXPERIENCES (EINSATZ DES VERFAHRENS ATTISHOLZ IN PAPIEROFABRIKEN UND DARAUS RESULTIERENDE ERFAHRUNGEN),
Cellulose Attisholz A.G., Luterbach (Switzerland).
For primary bibliographic entry see Field 5D.
W75-04951

'FLOAT WASH' -- A CLOSING-UP SYSTEM FOR THE PULP AND PAPER INDUSTRY,
Fractionator, Stockholm (Sweden). Aktiebolaget.
For primary bibliographic entry see Field 5D.
W75-04955

WATER CONSERVATION AND FIBER ECONOMY,
Thames Board Mills Ltd., Purfleet (England).
T. Frette.
Paper Technology, Vol 15, No 5, p 271-278 (T161-168), Oct, 1974. 14 fig, 12 ref.

Descriptors: *Water conservation, *Pulp and paper industry, *Water utilization, *Recirculated water, *Industrial water, *Water pollution control, Water circulation, Flow system, Legislation, Discharge(Water), Water consumption(Except consumptive use), Fibers(Plant).
Identifiers: *Fiber recovery.

Problems accompanying water utilization in the basic (primary, secondary, and tertiary) paper mill circulation systems are considered. Of great importance in the primary circulation system is the concentration difference between the diluting water and the desired breast box suspension, which ultimately determines the load on the secondary circulation, and hence on the final effluent. Diagrams illustrate the interplay between flows and concentrations at the wet end of the paper machine and the effect on the water economy. The design and control of the fiber recovery unit are particularly significant in the secondary circulation. Ideally, the secondary circulation system should be able to produce an acceptable substitute for white water, and thus be coordinated in the total mill water utilization scheme. Legislation governing discharges from the tertiary (outer) circulation system is also discussed. Methods of saving water are suggested, and an example is provided to illustrate fiber recovery in a fine paper mill. (Sykes-IPC)
W75-04956

THE FEDERAL WATER POLLUTION CONTROL ACT AND FORESTRY,
National Forest Products Association, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-04957

CALCULATION OF CONCENTRATION OF IMPURITIES IN THE RECYCLING SYSTEM OF PROCESS WATER IN KRAFT PULP MANUFACTURE (BERECHNUNG DER VERUNREINIGUNGSKONZENTRATION IM REZIRKULATIONS SYSTEM DER BETRIEBSWAESSER BEI DER SULFATZELLSTOFFHERSTELLUNG),
IRAPA, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W75-04959

REDUCTION OF FRESHWATER CONSUMPTION AT A BOARD MILL (OPYT L'VOVSKOI KARTONNOI FABRIKI PO SNIZHENNYU RASKHODA SVEZHEI VODY),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
For primary bibliographic entry see Field 5D.
W75-04961

INDUSTRIAL WATER PURIFICATION,
For primary bibliographic entry see Field 5D.
W75-04968

AT ABITIBI, IROQUOIS FALLS, $2.5-MILLION PRIMARY TREATMENT SYSTEM NEARS COMPLETION.
For primary bibliographic entry see Field 5D.
W75-04976

CHEMICAL AND NUTRITIONAL CHARACTERISTICS OF FISH PROTEIN CONCENTRATE PROCESSED FROM HEATED WHOLE RED HAKE, UROPHYCIS CHUSS,
National Marine Fisheries Service, College Park, Md. National Center for Fish Protein Concentrate.
D. J. Dubrow, and B. R. Stillings.
Fishery Bulletin, Vol 69, No 1, p 141-144, 1971. 3 tab, 10 ref.

Descriptors: *Food processing industry, *Fish, *Proteins, *Heat treatment, Effects, Amino acids, Nutrients, Chemical properties.
Identifiers: *Fish protein concentrate, *Red hake.

This investigation was designed to determine whether fish protein concentrate is affected by heating prior to its extraction by solvent. The lean fish, red hake, was heated at 100C, 109C and 121C for 10, 20, 40 and 80 min, the samples exstracted with isopropyl alcohol. Fish protein concentrate produced from the heated hake samples contained slightly less crude protein and more ash than did the fish protein concentrate produced from samples that were not heated. The amino acid composition of samples that had been heated did not differ markedly from those that were not heated. The nutritive quality of the samples that were heated at 100C and 109C was not significantly affected. Samples heated at 121C, however, were lower in nutritive quality than the controls. Conclusions are that red hake can be heated at 100C and 109C for as long as 80 min before being extracted by solvent without the protein quality being significantly affected. (See also W75-05016) (Jones-Wisconsin)
W75-05022

EFFECT OF ICE STORAGE ON THE CHEMICAL AND NUTRITIVE PROPERTIES OF SOLVENT-EXTRACTED WHOLE FISH--RED HAKE, UROPHYCIS CHUSS,
National Marine Fisheries Service, College Park, Md. National Center for Fish Protein Concentrate.
D. L. Dubrow.
Fishery Bulletin, Vol 69, No 1, p 145-150, 1971. 7 tab, 7 ref.

Descriptors: *Ice, *Storage, *Effects, *Fish, Amino acids, Proteins, Nutrients, Food processing industry, Chemical properties, Preservation.
Identifiers: *Fish protein concentrate, *Red hake.

The effect of ice storage of food-grade fish has on the chemical composition of the tissue components and on the nutritive quality of the protein was determined. Whole red hake were stored in ice for 2, 6, 8, and 11 days. The fish were organ-oleptically evaluated for freshness at each storage period and then processed by freeze-drying to form a reference sample or by solvent extraction with isopropyl alcohol to form a fish protein concentrate. These products were then analyzed for proximate composition and amino acid concentration and for protein quality. The results of the subjective evaluation for freshness indicated that the fish stored up to 8 days were still acceptable for food by that those stored for 11 days were not acceptable. The approximate composition of fish protein concentrates produced from fish stored up to 8 days in ice remained relatively constant. The crude protein in the concentrate produced from fish stored for 11 days decreased about 2.5%. It is concluded that storage of whole hake in ice up to 8 days is a satisfactory means of preservation prior to extracting the ground hake with isopropyl alcohol to produce fish protein concentrate. (See also W75-05016) (Jones-Wisconsin)
W75-05023

PRIMARY, PHYSICAL IMPACTS OF OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5C.
W75-05032

SIMULATION OF HYPOTHETICAL OFFSHORE PETROLEUM DEVELOPMENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
H. S. Lahman, J. B. Lassiter, and J. W. Devanney.
In: Primary, Physical Impacts of Offshore Petroleum Developments, MITSG 74-20, p 7-83, April 1974. 16 fig, 12 tab, 11 ref.

Descriptors: *Computer models, *Oil fields, *Exploration, Oil wells, Investment, Royalties, Continental shelf, Economies of scale, Decision making.

An offshore development model considers a series of hypothetical oil finds on the outer continental shelf and plots investors' development strategy, the resulting oil and gas production, the number of platforms, amount of drilling activity, and the mode and amount of transport activity. The model can be used for: Pre-decisions to lease by government bodies involving economic and environmental impact, and to determine the effects of changes in lease bidding, royalty, and regulatory policies. Post-decisions to lease by industry and government can be plotted to estimate the profits. Post-exploratory drilling by industry to determine maximum profit development strategy and post-exploratory drilling by government to monitor the development to ensure that production maximizes national income, and for regulating oil and gas prices. Minor modifications allow this program to be used to simulate onshore developments which employ directional drilling from central pads. For at least the internal gas drive fields, offshore oil production is characterized by very sharp economies of scale up to a break point field size and very gentle economies of scale thereafter. Above the break points, the model claims that offshore petroleum can be very cheap compared to the likely landed cost of imported oil and gas. (See also W75-05032) (Auen-Wisconsin)
W75-05033

SHRIMP CANNING WASTE TREATMENT STUDY,
Domingue, Szabo and Associates, Inc., Lafayette, La.
For primary bibliographic entry see Field 5A.
W75-05087

EFFECTS OF ECONOMIC DEVELOPMENT UPON WATER RESOURCES (AN INTERINDUSTRY APPROACH TO MODELING ECONOMIC-ENVIRONMENTAL SYSTEMS),
Maryland Univ., College Park. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6G.
W75-05174

AQUATHERMAL FLUID MIGRATION,
Imperial Oil Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 4B.
W75-05182

POSSIBILITIES OF CONVERTING PART OF THE PIRITU LAGOON (STATE OF ANZOATEGUI) INTO AN ARTIFICIAL SALT PIT, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
J. Carvajal Rojas.
Lagena. 29. 7-11. Illus. 1972.
Identifiers: Anzoategui, Elops-saurus, Eucinostomus-argenteus, Eugerres-plumieri, Fish, *Lagoons, Lakes, Moharra-rhombea, Mugil-curema, Mugil-liza, Penaeus-schmitti, Production, Rainy, *Salt pits(Artificial), Season, Strongylura-marina, *Venezuela(Piritu Lagoon).

The lagoon is in eastern Venezuela, between 10 degrees 2 minutes-10 degrees 5 minutes N latitude and 65 degrees 2 minutes-65 degrees 11 minutes W longitude and is 37 k sq m in area. It communicates with the sea by an outlet 200 m wide. The water has a salinity of 37%; a July temperature of 29C on the surface. This reaches 40C in the dry season when the salinity is 92% with a consequent destruction of fish. In March 1971, the margins of the lagoon were covered with dead fish: Elops saurus, Eugerres plumieri, Moharra rhombea, Eucinostomus argenteus, Mugil curema and Strongylura marina. At this time, 7 km sq of water is left. The remaining lake is necessary for the life cycle of M. liza, M. curema and Pennaeus schmitti. The total fish production of the lagoon of Piritu between 1967-1970 had an annual yield of 107,000 kg and was distributed by 100 fisherman. The artificial salt lake at Araya (State of Sucre, Venezuela) produces 60,000 tons of NaCl yearly. A similar artificial salt bed at Piritu could produce 660,000 tons (metric) of salt yearly. This requires engineering work to prevent inundation in the rainy season. The rain does not exceed 300 mm yearly.--Copyright 1974, Biological Abstracts, Inc.
W75-05276

NATIONAL NEED - AN INDUSTRY VIEW OF RESEARCH,
AMAX Lead and Zinc, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 5G.
W75-05299

3F. Conservation In Agriculture

CRESTED WHEATGRASS YIELDS AS INFLUENCED BY WATER CONSERVATION PRACTICES,
Agricultural Research Service, Logan, Utah.
A. T. Bleak, and W. Keller.
Agron J. Vol 66 No 2, 3 p 326-328. 1974.
Identifiers: Agropyron-Desertorum, *Evaporation, Fertilization, Mulch, Transpiration, *Water conservation, *Wheatgrass, *Crops production.

Evaporation of water from the soil surface is a major economic loss to the western USA, because water is the primary limiting factor in plant growth on arid and semiarid rangelands. 'Nordan' crested wheatgrass (Agropyron desertorum (Fisch. ex Link) Schult.) was planted in rows 1.1 m apart; the effect on total herbage yield of a gravel mulch, a sheet metal 'mulch', close rows of grass, and cereal grain seeded between the grass rows was determined for a 2-yr period. Some treatments received different rates of N fertilizer. Sheet metal between the rows, covering 86% of the land surface, increased mean 2-yr yield about 112% over clean cultivation (check). A gravel mulch 1.5 cm deep increased mean yield about 16%. Close rows of grass and cereal grain between the grass rows also increased total yield . Benefit from N at 22, 44, or 66 kg/ha/yr was minor. Benefit from the mulches was greater the 2nd yr than the 1st.--Copyright 1974, Biological Abstracts, Inc.
W75-04873

EFFECT OF SOIL WATER AT VARIOUS GROWTH STAGES ON SOYBEAN YIELD,
Agricultural Research Service, Auburn, Ala.
B. D. Doss, R. W. Pearson, and H. T. Rogers.
Agron J. Vol 66 No 2 p 297-299. 1974. Illus.
Identifiers: Glycine-Max, *Growth rates, Irrigation, *Soil water, *Soybeans, *Crop production, *Alabama.

Insufficient water during flowering and pod-fill stages frequently limits yields of soybeans (Glycine max (L.) Merr.). In a 3-yr experiment, field plot covers were used to control rainfall and water stress was imposed on plants at various stages of growth to determine more specifically the critical periods for irrigating soybeans for maximum yields. Soil water regimes ranged from a limited supply (10% available soil water) to adequate water (50% available) during the entire growing season. More bean production was obtained from water applied after full bloom than earlier. The pod-fill stage, Aug. 15-Sept. 20 for 'Bragg' soybeans at Thorsby, Alabama, was the critical time for adequate water for maximum yields. Yields from adequately watered soybeans were 540-1040 kg/ha, or 24-55% greater than where water was limited throughout the growing season. Highest yield obtained under the best water regime was 3320 kg/ha. Conditions limiting yields were not obvious.--Copyright 1974, Biological Abstracts, Inc.
W75-04877

DIURNAL CYCLING IN ROOT RESISTANCE TO WATER MOVEMENT,
Duke Univ., Durham, N.C. Dept. of Botany.
L. R. Parsons, and P. J. Kramer.
Physiol Plant. Vol 30, No 1, p 19-23. 1974 Illus.
Identifiers: *Cotton, *Cycling(Diurnal), Gossypium-Hirsutum, Growth rates, Light, Nitrogen, Pressure, Regulator, Resistance, *Root systems, Salt concentration.

The occurrence of diurnal changes in root resistance of cotton (Gossypium hirsutum) was studied by measuring the flow of water through 35-70-day old root systems under a pressure of 3.10 bars or a vacuum of 0.88 bar. The volume of exudate obtained under constant pressure or constant vacuum was 2-3 times greater near midday than near midnight indicating that the root resistance apparently was 2-3 times greater at night than during the day. The salt concentration of the exudate also cycled; the concentration was lowest at midday and highest at night, hence there was little diurnal variation in the total amount of salt moved/h. The cycle for volume of exudate, salt concentration, and apparent root resistance had a period of 22-26 h at 24 degrees C. The cycle gradually died away 2-3 days after removal of the shoots. The diurnal variations appeared to be controlled by signals from the shoots because the phase of the cycles could be reset by changing the light-dark cycle under which the plants were grown. Cycling was eliminated by exposure to 8 or more days of continuous light before removing the shoots, and cycling could not be entrained by a 6 h light-6 h dark cycle. Bubbling N2 gas through the nutrient medium stopped cycling. A possible role of ion or growth regulator action is discussed.--Copyright 1974, Biological Abstracts, Inc.
W75-04885

MULTIPLE USES OF UTAH IRRIGATION CANALS: CACHE COUNTRY AS A CASE STUDY,
Utah Cooperative Forest Recreation Research Unit, Logan.
For primary bibliographic entry see Field 4A.
W75-04939

PHOSPHOROUS ASSOCIATED WITH SEDIMENTS IN IRRIGATION AND DRAINAGE WATERS FOR TWO LARGE TRACTS IN SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 5B.
W75-04999

THE EFFECT OF PLANT SPACING, NITROGEN FERTILIZER AND IRRIGATION ON THE APPEARANCE OF SYMPTOMS AND SPREAD OF VIRUS YELLOWS IN SUGAR BEET CROPS,
For primary bibliographic entry see Field 5C.
W75-05020

THE COURSE AND MAGNITUDE OF WATER STRESS IN LOLIUM PERENNE AND DACTYLIS GLOMERATA,
Imperial Coll. of Science and Technology, London (England). Dept. of Botany.
D. K. Jackson.
J Agric Sci. Vol 82, No 1, p 19-27, 1974, Illus.
Identifiers: *Dactylis-glomerata, Diffusion, Drought, Evaporation, Irrigation, Leaf, *Lolium-perenne, Roots, Stomatal, *Water stress, Wilting.

Simulated swards of Dactylis glomerata (var. S.37) and Lolium perenne (var. S.23) were grown in large lysimeters or vertical pipes of 15 cm diameter, both sufficiently deep to allow largely unrestricted root development. Rainfall was excluded, and the effect of a drying cycle on the plant water balance was compared with irrigated controls in a sequence of sampling harvests at increasing soil water deficits. Leaf water potential fell during the day, both in treatments and controls, to levels which might be expected to reduce extension growth and, frequently, stomatal diffusion. Rapid recovery occurred in the evening to levels which might allow normal functioning of growth processes not dependent on sunlight. Defoliation reduced plant stress and stomatal restriction. The amelioration of plant water stress appeared to require a reduction in atmospheric evaporative demand, and irrigation had relatively little effect. The leaf water status was more sensitive to drought, transpiration was reduced more, and the root system extended more slowly in Dactylis than in Lolium. Consequently, the onset of permanent wilting due to exhaustion of water from the profile was delayed compared with Lolium. The characteristic might enhance the survival of Dactylis in prolonged drought, but prove disadvantageous in terms of growth during short droughts, when reduced stomatal opening might limit CO2 uptake. This would not be an impediment, however, if investigations suggesting that partial closure has a minor effect on CO2 uptake compared with that on transpiration were to be confirmed.--Copyright 1974, Biological Abstracts, Inc.
W75-05056

CROP INSURANCE AND INFORMATION SERVICES TO CONTROL USE OF PESTICIDES,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-05070

EFFECT OF FERTILIZER RATES AND IRRIGATION ON FUSARIUM INFECTION OF WINTER WHEAT,
University of Agriculture, Debrecen (Hungary). Dept. of Agronomy.
E. Bocz, E. Hefni, and O. Toth.
Acta Agron Acad Sci Hung 23(1/2): 87-91 1974.
Identifiers: *Fertilizers, *Fusarium infection, Germination, *Nitrogen fertilizer, *Irrigation, *Wheat(Winter), Fertilizer rates.

In Fusarium-infected wheat the kernels shrivelled, the 1000-kernel weight and germination % decreased when the doses of N fertilizer were high. The highest mean % of germination in unirrigated subplots was 88% while the lowest mean was 82.5% obtained at the highest rates of fertilizer. In the irrigated subplot, the highest mean of germination was 90% obtained from the control while the lowest mean was 81% obtained from the highest rates of fertilizer. The baking quality gradually improved by increasing the doses of N fertilizer up to 300 N kg/ha, without irrigation, while it reached its peak at 200 N + 100 P2O5 + 100 K2O kg/ha of fertilizer rates with irrigation.--Copyright 1974, Biological Abstracts, Inc.
W75-05073

LOSSES OF FERTILIZERS AND PESTICIDES FROM CLAYPAN SOIL,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-05081

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS,
East Central State Coll., Ada, Okla. School of Environmental Science.
For primary bibliographic entry see Field 10B.
W75-05084

USE OF REMOTE SENSING IN AGRICULTURE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W75-05107

WEATHER MODIFICATION-RELATE UNCERTAINTIES IN ECOLOGICAL AND AGRICULTURAL SYSTEMS IN THE HIGH PLAINS: SCIENTIFIC APPRAISAL AND RECOMMENDED RESEARCH,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 3B.
W75-05118

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME I,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W75-05123

RESEARCH IN REMOTE SENSING OF AGRICULTURE, EARTH RESOURCES, AND MAN'S ENVIRONMENT,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W75-05132

UTILIZING ERTS IMAGERY TO DETECT PLANT DISEASES AND NUTRIENT DEFICIENCIES, SOIL TYPES AND SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville. Dept. of Plant and Soil Science.
W. L. Parks, J. I. Sewell, J. W. Hilty, and J. C. Rennie.
Available from the National Technical Information Service, Springfield, Va. 22161, as N74-28828, $4.25 in paper copy, $2.25 in microfiche. Final Report, March 1, 1974. 44 p, 15 fig, 9 tab, 16 ref. NAS5-21873.

Descriptors: *Remote sensing, *Satellites(Artificial), *Agriculture, *Forests, Wetlands, Land use, Soil moisture, Land management, Soil classification, Soil surveys, Sedimentation, Erosion, Flood plains, Tennessee.

Imagery from the ERTS-1 satellite was useful in delineating soil associations and dividing soils into groups with similar land use management. ERTS imagery offers definite potential for making gross flood-plain, wetland, river shoreline, and land use change surveys. Determinations of volume strata and forest type from the two usable bands of ERTS imagery were of questionable value. Because no imagery was received covering the target area during the time of the year when studies on maize dwarf mosaic virus and southern corn leaf blight are active, no report of the plant disease phase of the investigation was possible. (Sims-ISWS)
W75-05133

AGRICULTURAL LAND USE IN THE POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. G. Evans, W. R. Walker, and G. V. Skogerboe.
Report AER 73-74 RGE - WRW - GVS1, October 1973. 213 p, 89 fig, 240 tab. OWRR B-083-COLO(8).

Descriptors: Agriculture, *Land use, *Consumptive use, Industrial water, Irrigated crops, Municipal water, Surfaces, Phreatophytes, Mapping, Maps, Data collections, *Colorado.
Identifiers: *Poudre Valley(Colo).

Agricultural land use was mapped in each township of the Poudre Valley along with other important land uses such as urban, phreatophyte, and water surface acreages. Data were collected using aerial photographs. The land use data were transferred to computer storage and to overlay maps. The results of this land classification are presented in a township by township and canal by canal manner. (Skogerboe-Colorado State)
W75-05260

EFFECTS OF PLANT DENSITY, IRRIGATION AND POTASSIUM AND SODIUM FERTILIZERS ON SUGAR BEET: I. YIELDS AND NUTRIENT COMPOSITION,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
For primary bibliographic entry see Field 2I.
W75-05265

ACCUMULATION OF AVAILABLE MOLYBDENUM IN AGRICULTURAL SOILS IRRIGATED WITH HIGH-MOLYBDENUM WATERS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-05297

ROOT DEVELOPMENT AND NUTRIENT UPTAKE BY CORN GROWN IN SOLUTION CULTURE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. D. Warneke, and S. A. Barber.
Agronomy Journal, Vol 66, p 514-516, July-August 1974. 6 tab, 6 ref. OWRT B-026-IND (5).

Descriptors: *Nitrogen, *Root Development, Phosphorus, Potassium, Calcium, Magnesium, Root distribution, Nitrates, *Corn(Field), *Nutrients, *Absorption.
Identifiers: Root-Shoot Ratio.

Although nutrient uptake by young corn (Zea mays L.) roots from solution culture has been extensively studied, little information is available on the rate of root development and nutrient uptake during the entire development of the corn plant. Corn root growth rate, the nutrient content of the root and shoot, and the nutrient uptake rate were studied for five stages of development of corn plants growing in solution culture in the greenhouse. The data were compared with similar observations in the field. Corn root length increased exponentially with time until the tasseling stage, as also occurred in the field. Beyond this stage root length in solution cluture increased slowly. The proportion of N, P, K, Ca, and Mg present in the roots ranged from 0.11 to 0.22 and averages 0.15 of the total. Nutrient uptake rate per meter of root was greatest for the first growth stage and decreased with plant age. Rates of uptake per meter or root were similar to those obtained in the field except that the rates for the youngest plants in solution culture were slower than for similar plants grown in the field.
W75-05305

AN AGRICULTURAL IRRIGATION MODEL FOR A WATERSHED,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
G. T. Thompson.
Report PNW 74-47, (1974). 51 p, 4 fig, 1 tab, 14 ref, append. For presentation at the 1974 Annual Meeting of the Pacific Northwest Region of the American Society of Agricultural Engineers. Twin Falls, Idaho. B-036-WASH, B-043-WASH (2), and B-050-WASH (2).

Descriptors: Model studies, Computer models, *Washington, Watershed management, Irrigation, Agriculture, Irrigation efficiency, Water requirement, Water demand, Crop production, Farm management.
Identifiers: *Yakima River(Wash).

An irrigation model was tested by application to the Yakima River watershed in the state of Washington. The tests were conducted using recent cropping histories and other data. Comparisons were made between the predicted flows and measured river flows on the Yakima River. Essentially, it was found that if recent cropping patterns and efficiencies of irrigation occurred, the water demands could not be met. Water requirements could be met, however , by increasing the overall irrigation efficiency by 15%. The irrigation model presented provides a basis for planners to analyze the effects of existing and proposed irrigation activities on watersheds including those that are large and complex. Preparatory to using the model, basic data concerning irrigation areas to be serviced, cropping pattern and planned water use, return flow parameters and economic data covering costs of facilities, and management must first be developed.
W75-05307

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

FLOOD PLAIN INFORMATION: KANSAS AND WAKARUSA RIVERS, LAWRENCE, KANSAS,
Army Engineer District, Kansas City, Mo.
Prepared for the City of Lawrence, Douglas County and the Kansas Water Resources Board, April 1969. 46 p, 16 fig, 10 tab, 21 plates.

Descriptors: Floods, *Flooding, *Flood control, *Flood protection, *Levees, Flood plain, Flood plain zoning, *Kansas, Historic floods.
Identifiers: Kansas River(Kan), Wakarusa River(Kan), Lawrence(Kan), Douglas County(Kan), Intermediate Regional Flood, Standard Project Flood, Rock jetty, Rock blanket.

Lawrence and its southern suburban areas are subject to flooding from the Kansas River with a drainage area of 58,504 square miles, and Wakarusa River which drains an area of 516 square miles. Kansas River flood plain, 2 to 3 miles wide, is primarily agricultural but changing in land use with the increased development of Lawrence. Obstructions to flood flow include 3 bridges and a weir type dam. Existing flood protection consists of drainage levees, private agricultural levees, rock jetties, rock blankets, and channel improvements as well as several upstream projects. The Wakarusa River, joining the Kansas River south of Lawrence, slopes at 2 feet per mile in the study area which is devoted to agriculture with industrial encroachment occurring on the flood plain. The city and county plan to zone flood plain uses consistent with the flood hazard. Corps of Engineers has begun construction of a system of levees and channel improvements scheduled for completion in 1971. The greatest flood occurred in July 1951 when the Kansas River remained above flood stage for approximately 10 days with a peak discharge of 483,000 cfs with damage estimated at $3,121,000 and the Wakarusa had a peak discharge of 40,600 cfs with $2,500,000 damage estimated for the Wakarusa basin. Floods are mostly of relatively slow rise and long duration. Peak discharges for Intermediate Regional Flood on the Kansas and Wakarusa Rivers would be 190,000 cfs and 54,000 cfs respectively. A Standard Project Flood peak discharge on the Wakarusa River would be 92,000 cfs. A Standard Project Flood on both rivers would inundate approximately the same area as the July 1951 flood with water overtopping the levee system on the Kansas. (Salzman-North Carolina)
W75-04852

FLOOD PLAIN INFORMATION – GREENS AND HALLS BAYOUS, HARRIS COUNTY, TEXAS,
Army Engineer District, Galveston, Tex.
Prepared for Harris Soil and Water Conservation District, Houston, Texas, and the Texas Water Development Board, Austin, Texas, June, 1972. 41 p, 6 tab, 12 fig, 44 plates, glossary.

Descriptors: *Flood control, *Flood protection, *Non-structural alternatives, Regional flood, Peak discharge, Historic floods, River basin development, Floods, Floodways, Floodwaters, Flood peak, Flood data, Flood damage, Flood plain zoning, *Texas.
Identifiers: *Greens Bayou(Tex), *Halls Bayou(Tex), Hurricane surge, Tidal flooding, Standard Project Flood, Intermediate Regional Flood.

To the north and east metropolitan Houston, Texas, is bounded by and partially includes the 454 square miles of the combined watersheds of Greens Bayou and its principal tributary, Halls Bayou. Greens Bayou flows into the Houston Ship Channel (Buffalo Bayou) in the city. Heavy industrial development is on its flood plain in the river's first four miles. The flood plains of the middle reaches of both rivers are rapidly becoming urbanized with residential and commercial development, and the rapid growth of Harris County is encroaching on the upper reaches. Ten railroad and 48 vehicular bridges cross the Bayous, adding to the obstruction of their relatively flat channels during the frequent floods. Thunderstorms and occasional hurricanes cause flooding on both Bayous. Hurricane surges also cause tidal flooding on the lower 12 miles of Greens Bayou. The worst flood (July, 1954) in the 20 years of available gage records showed peak discharge of 7000 cfs which caused severe industrial, residential, and commercial damages. An Intermediate Regional Flood, recommended as the minimum design flood level, would have peak discharge of 25,400 cfs and a hazardous, eroding, main-channel velocity of 6.3 feet per second. A Standard Project Flood would be even more severe: 46,600 cfs, 7.7 feet per second, respectively. Structural control measures can be located with the aid of the report's maps and cross sections. Guidelines for flood plain management including non-structural measures such as zoning, subdivision regulations and building codes, are described and urged to minimize damages on the flood plain. (Herr-North Carolina)
W75-04853

FLOOD PLAIN INFORMATION: CHOCOLATE BAYOU, BRAZORIA COUNTY, TEXAS,
Army Engineer District, Galveston, Tex.
Prepared for Brazoria County Conservation and Reclamation District Number Three. June, 1971. 35 p, 9 tab, 6 fig, 18 plates, glossary.

Descriptors: *Flood control, *Flood protection, *Non-structural alternatives, *Floods, Flood data, Flood plains, Flood profiles, Floodways, Floodproofing, Historic floods, Maximum Probable Flood, Peak discharge, *Texas.
Identifiers: *Chocolate Bayou(Tex), Comprehensive Flood Damage Prevention Planning, Intermediate Regional Flood, Standard Project Flood, Brazoria County(Tex).

Chocolate Bayou flows through the town of Liverpool, Texas and into Galveston Bay to the southeast. In the upper reaches of its 159-square mile watershed it is a few miles south of Houston. This has been an agricultural area, but with recent development of a petrochemical industrial site along the Bayou plus expansion pressures from Houston, three residential developments have been built and more are anticipated along the flood plain. Stream gaging records and newspaper reports, as well as interviews, establish the flood pattern. Severe spring and summer thundershowers and occasional winter storms have flooded the Bayou on an average of more than once each year for the last 20 years. Generally the flood plain remains flooded for several days. In July, 1939, the Bayou's largest recorded flood measured 22.90 feet at the gage on State Road 1462, with a peak discharge of 15,600 cfs. This crest is two feet lower than the computer Standard Project Flood, with a peak discharge of 29,500 cfs. Future floods will be more extensive, deeper, swifter and more hazardous due to indiscriminate filling and construction along the channel, and the typically greater runoff from developed areas. Several non-structural alternatives for flood plain management include comprehensive development plan, preservation of open space, and the limitation of public utility extensions for the flood plain. (Herr-North Carolina)
W75-04854

FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, NEW CASTLE COUNTY, DELAWARE,
Army Engineer District, Philadelphia, Pa.
Prepared for New Castle County Department of Planning, July, 1973. 26 p, 8 tab, 8 fig, 12 plates, glossary.

Descriptors: Floods, *Flood control, *Flood protection, *Delaware, *Flood profiles, River basin development, Flood damage, River forecasting, Flood data, Flood frequency, Flood plain zoning, Historic floods, Peak discharge.
Identifiers: *Brandywine Creek(Del), Wilmington(Del), Intermediate Regional Flood, Standard Project Flood, Flood plain management.

Early industrial development along Brandywine Creek above its mouth at Wilmington, Delaware, was encouraged by its steep gradient (25 feet per mile) and swift current. Today there are 9 small dams across the Brandywine which, along with 19 bridges in the 10-mile reach under study, offer considerable obstruction to flood flow. There has been recent industrial development on the flood plain and pressure for residential development. In Wilmington much of the flood plain above Market Street is incorporated in Brandywine Park. The city's filtration plant is located near the river, and has experienced interruption of service during floods. Further development on the flood plain is now prohibited by a New Castle County Ordinance which will limit further damage, but not protect the considerable development already there. In the maximum flood of record, June 23, 1972, Hurricane Agnes caused severe flooding. Brandywine Creek crested at 15.5 feet in Wilmington with a peak discharge of 29,000 cfs. The area flooded by a Standard Project Flood would be more extensive, including industrial, commercial, and residential property, with a peak flow of 73,100 cfs. Ten dams on the East and West Branches are proposed, with two already built, which will reduce flooding on the main stem. (Herr-North Carolina)
W75-04855

FLOOD ESTIMATION FOR URBAN AND RURAL CATCHMENTS,
Snowy Mountains Engineering Corp., Cooma (Australia). Hydrology Branch.
A. P. Aitken.
Australian Road Research, Vol 5, No 3, p 50-71, October, 1973. 5 fig, 38 ref.

Descriptors: *Flood forecasting, *Mathematical models, *Hydrographs, *Rational formula, *Australia, Computer models, Engineering, Rural areas, Urban areas.
Identifiers: Storm water management models.

Procedures for flood estimation of urban and rural catchments in Australia are examined. A 1958 publication entitled Australian Rainfall and Runoff, a guide to practicing engineers, is being revised. Criticisms of the publication follow new developments in hydrology, particularly those of mathematical and computer models. Methods for studying urban catchments include the Transport and Road Research Laboratory Hydrograph Model (TRRL), a British computer model; the Rational Formula, a statistical model; and mathematical models such as the complex Storm Water Management Model. Mathematical models may have indirect or direct applications. For urban catchments, despite its limitations, the Rational Formula is most widely used in Australia; however, additional research is needed, including collection of more urban rainfall-runoff data. Methods for investigating flood estimation for rural catchments include the Rational Formula, the soil conservation method, the Bureau of Public Roads method, and the tacitly maximised peak method. Hydrograph techniques and mathematical models are still in developmental stages for rural areas. A frequency analysis of stream flow records is the most used method for Australian rural flood estimation. (Prague-FIRL)
W75-04856

SOUTHERN TIER EAST REGION, BROOME-TIOGA COUNTIES, NEW YORK COMPREHENSIVE DRAINAGE STUDY, REPORT SUMMARY,
V. O. Shumaker, and K. C. Hawk.
Southern Tier East Regional Planning Board, Binghamton, New York, March 1974. 24 p, 3 fig.

Descriptors: *Surface drainage, *Storm runoff, *Flood control, *Erosion control, *Watershed management, Storage, Detention reservoirs, Land use, Water conservation, Soil conservation, Soil erosion, Retention, Regional analysis, Design criteria, Water policy, New York, Local governments, Planning, Water resources planning.
Identifiers: *Tioga County(New York), Broome County(New York), *Susquehanna River.

The data and findings are summarized contained in the Southern-Tier East Region, Broom-Tioga Counties, New York Comprehensive Drainage Study. The region is in the south-central part of New York, adjacent to Pennsylvania. The study area is in the glaciated Allegheny Plateau between the Allegheny Mountains and the lower slopes of the Catskill Mountains. The 1236 square miles of rough topography receives 36 inches annual precipitation and is drained primarily by the Susquehanna River. Two-thirds of the 1970 population of 268,328 persons live along both sides of the Susquehanna. To facilitate the study of storm drainage, the region has been subdivided into forty-four different planning basins containing one or more major watersheds as shown on the included map. The existing drainage problems are related to erosion and flooding in urban areas along tributaries of the Susquehanna. Anticipated future major drainage problems are associated closely with new development or changing land uses. Upstream control measures that should be undertaken include the following: land use control and water conservation on agricultural lands; use of flood control and debris collection reservoirs; and on-site detention storage of runoff. Downstream protection measures for storm drainage problems include storage, channel stabilization, flood control structures, enlargement of existing facilities, and land use control. These measures, except land use controls, should be considered supplemental to upland control. They may become necessary for economical reasons or because existing upland development or other topographical considerations preclude the use of upstream control measures. (Poertner)
W75-04858

INTERIOR DRAINAGE STUDY, PUMPING PLANT B AREA, DALLAS FLOODWAY PROJECT,
URS Forrest and Cotton, Inc., Dallas, Tex.
For primary bibliographic entry see Field 8B.
W75-04859

INTERIOR DRAINAGE STUDY, WEST LEVEE, DALLAS FLOODWAY PROJECT,
URS Forrest and Cotton, Inc., Dallas, Tex.
For primary bibliographic entry see Field 8B.
W75-04860

HYDROLOGIC ASPECTS OF A LOW FLOW WATER MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia.
R. T. Milhous.
Paper presented at the 1973 Pacific Northwest Regional American Geophysical Union Meeting, Missoula, Montana, October 18-19, 1972. 11 p, 3 fig, 8 ref.

Descriptors: *Low flow, *Streamflow, *Administration, *Water policy, *Water utilization, *Water allocation(Policy), Washington, Legislation, Water conservation, Regulated flow, River flow, Perennial streams, Water users, Water demand, Streamflow forecasting, Planning.
Identifiers: *In-stream water uses, *Out-of-stream water uses, Preservation flows, Riggs flow forecasting procedures.

The 'Water Resources Act of 1971', passed by the Washington State Legislature, required that the utilization and management of the waters of the State shall be guided by a number of fundamentals. Included are declarations that both instream and out-of-stream uses of water are beneficial; the allocation of waters among potential uses and users shall be based (generally) on securing the maximum net benefits for the people of the State; and perennial rivers and streams shall be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic, and other environmental values. In a water management program allocating the waters between competing uses, it is important to know the water required for various uses (especially instream uses), to know the water available for allocation, and to be able to manage (regulate) the use of the water. The various methodologies of estimating flow requirements for fisheries have been reviewed and the calculated flow requirements have been found to be above the availability in many cases. The methodologies for estimating the availability of water have also been reviewed and the best method found to be one based on miscellaneous measurement. Methods of regulating flows have also been reviewed and the method using 'control' points was found to be the best procedure. The management of the water must be based on sound hydrologic principles. (Poertner)
W75-04862

STREAM PROGRAMMER'S MANUAL.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W75-04874

FLOOD FREQUENCY AND RISK,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
G. W. Kite.
(1974), 263 p, 13 fig, 40 tab, 30 ref.

Descriptors: *Floods, *Flood control, *Frequency, *Forecasting, *Probability, Mathematical models, Equations, Methodology, Analytical techniques, Distribution, Hydrologic properties, Regional analysis, Protection, *Risks.
Identifiers: *Risk analysis.

The background and justification for probability and risk analysis in the forecasting of floods are discussed. The use of specific procedures to determine plotting positions, choose a probability distribution and compute design event magnitudes and their confidence limits is recommended. Other topics discussed include the advantages of regional analysis and design procedures based on a specified project risk or hydrologic risk. It is concluded that the mean frequency should be used as a plotting position, that the lognormal distribution is of more practical use than many other distributions and that some form of risk analysis should be used for all hydrologic designs. (Environment Canada)
W75-04876

HYDROLOGIC FORECASTING IN THE WATER RESOURCES BRANCH,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
G. W. Kite.
1974, 24 p, 6 tab, append.

Descriptors: *Forecasting, *Runoff forecasting, *Hydrology, Warning systems, Methodology, Research, Surveys, River forecasting, Drainage, Snowmelt, Snow cover, Water temperature, *Canada, Snow surveys.
Identifiers: River depth, Ice thickness.

Forecasting of river flows and other hydrologic parameters usually only attracts public attention during floods and droughts. Throughout the year, however, hydrologic forecasting is of equal importance for planning basin use, power development, navigation, pollution disposal, recreation opportunity, water supply and many other uses. The Water Resources Branch is involved in the provision of data to forecasting agencies, the provision of forecasts, and the provision of forecasting knowledge in a consultative role to other agencies. Some of these forecasts have been provided over a considerable period; up to 30 years or more in some instances. The current hydrologic forecasting activities of the Branch are described. (Environment Canada)
W75-04881

INFILTRATION ROLE OF LARGE SOIL PORES: A CHANNEL SYSTEM CONCEPT,
Nevada Agricultural Experiment Station, Reno.
For primary bibliographic entry see Field 2G.
W75-04919

THE OVERLAND FLOW PROCESS UNDER NATURAL CONDITIONS,
Purdue Univ., Lafayette, Ind., Agricultural Experiment Station.
G. R. Foster.
In: Biological Effects in the Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 173-185. 7 fig, 17 ref.

Descriptors: *Overland flow, *Flow resistance, *Obstruction to flow, *Erosion, Flow, Design flow, Flow friction, Friction, Runoff, Natural flow, Soil, Sediments, Suspended solids, Infiltration, Hydrographs, Hydrology.
Identifiers: Natural conditions, Parameters, Fluid flow, Water drag.

Sediment yield as well as runoff from small watersheds was found to be closely related to overland flow which generally concentrated quickly over bare eroding soil. A runoff hydrograph was simulated with a kinematic model that included retention storage, infiltration, and hydraulic roughness parameters. The choice of infiltration parameters for freshly tilled dry soils was found to be most critical. Next was retention storage. For surfaces where the flow concentration pattern had developed, a constant friction factor was satisfactory for hydrograph simulation for slope lengths as long as 35 feet. The friction factor was found to depend on soil erodibility and runoff rate, but not on slope steepness. Also, limited data indicated that it was a function of slope length as well. The friction factor was found to vary with soil erodibility to the negative 2.8 power and with runoff rate to the negative 0.8 power. The more erodable soils eroded into more efficient rill systems, which lowered the friction factor. Also, the increased erosion due to increased runoff apparently contributed to smaller friction factor values. (See also W75-03023) (Roberts-ISWS)
W75-04920

MECHANICS OF SURFACE RUNOFF ON HILLSLOPES,
Agricultural Research Service, Athens, Ga. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2E.
W75-04921

STORMFLOW PRODUCTION FROM PERMEABLE UPLAND BASINS,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2A.
W75-04925

ROOKERY BAY LAND USE STUDIES, THE RESOURCE BUFFER PLAN: A CONCEPTUAL LAND USE STUDY,
Miami Univ., Fla. Center for Urban Studies.
A. R. Veri, A. R. Marshall, S. Y. Wilson, J. H. Hartwell, and P. Rosendahl.
Available from National Technical Information Service Springfield, Va. 22161, as PB-239 862, PC$3.75,MF$2.25. The Conservation Foundation, Washington, D.C. Study Rept. No. 2, Oct 73. 41 p, 10 fig, 2 tab, 24 ref. OWRT C1817(No. 3170)(6).

Descriptors: *Florida, *Water Management(Applied), *Land use, Human population, Comprehensive planning, Water pollution, *Mangrove swamps, *Land management, Bays, *Ecosystems, Water districts, Ecology, Land resources, Resources, Alternative planning.
Identifiers: *Rookery Bay Sanctuary(Fla), Resource buffer plan.

This study provides an alternative conceptual land use plan, development guide lines and implementation policies for Water Management District No. 6 in Collier County, Florida. This District encompasses most of the uplands and waterways which drain into the Rookery Bay Sanctuary, a 5,000-acre preserve owned by the National Audobon Society. Several plans were proposed: The Perimeter Canal Concept (1968); The Interceptor Canal Concept (1972); and The Resource Buffer Concept (1973). The latter is proposed by this study. The Resource Buffer Plan proposes to use naturally functioning ecological systems (water, vegetation, and distance) as the 'buffer'. The two previously proposed plans would advocate extensive filling of wetlands and rely upon untested technology and the judgement of supervising personnel to operate a canal-like 'buffer' around the landward perimeter of the mangrove to intercept, assimilate, and distribute contaminants to tide. This study evaluates the affect of holding land from development upon the ultimate populations and densities within the study area. Various possibilities for land preservation are discussed including transfer development rights. A descriptive list of flora and fauna, geology, water resources and soils is provided.
W75-04929

MULTIPLE USES OF UTAH IRRIGATION CANALS: CACHE COUNTRY AS A CASE STUDY,
Utah Cooperative Forest Recreation Research Unit, Logan.
J. J. Kennedy, and K. Unhanand.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 830, $5.25 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan, Report No PRJERO24-1, 99 p, 3 fig, 6 tab, 5 append. 1974. OWRT A-017-UTAH(1), 14-31-0001-3845.

Descriptors: *Canals, *Multiple purpose, *Recreation, Wildlife, Flood control, Trout, Management, Legal aspects, *Utah, *Irrigation canals.
Identifiers: Cache County(Utah).

Irrigation use is an obvious benefit of Utah canals that has been recognized for over 100 years. This study attempts to illustrate other, less obvious, uses. The major use examined was recreational, but canals are presently functioning as storm drainage systems and have potential for diverting flood crests in many river systems. Recreational use of canals, falls into two categories. There is passive use such as its landscape values, affects on creating shade and bird-wildlife habitat, etc., that is difficult to quantify but no less important than active canal use such as tubing, hiking, bankplay, bicycling, etc. Several canals were selected in and about Logan, Utah, and considerable active use; this will probably increase with suburban expansion. A Logan City canal that flowed yearround was also electro-shocked and found to have a resident brown trout population as great as many exceptional trout streams in the west. The multiple uses of this case study can best by summarized as a contrast between community benefits and conflict. In return for the thousands of hours of public enjoyment that irrigation companies now provide, they get nothing but problems. IF communities don't begin to recognize the value of their canals and cooperate with canal companies to equitably share in the cost of public use, then canals of Utah will continue to be withdrawn from public use and become another amenity that is sacrificed to urbanization.
W75-04939

CONTROL OF AQUATIC WEEDS FROM WATER BODIES USING GRASS CARP,
Central Public Health Engineering Research Inst., Madras (India). Zonal Centre.
H. L. Bhatia, C. A. Sastry, and R. K. Nigam.
Indian Journal Environmental Health, Vol 15, No 2, p 92-99, 1973. 2 fig, 2 tab, 14 ref.

Descriptors: *Biocontrol, *Carp, *Aquatic weed control, Fish, Submerged plants.
Identifiers: *Grass carp, Ctenopharyngodon idella, Bhopal(India), *India.

A series of feeding experiments were carried out in three nursery ponds at Bhopal, India during October 1968 to March 1969 in order to assess the quantities of submerged aquatic weeds that can be consumed by grass carp (Ctenopharyngodon idella) and the preference of the fish for a particular weed. During the course of experiments the water in the experimental nursery ponds was regularly analyzed for pH, temperature, dissolved oxygen and plankters. The fish were found to consume almost all types of noxious aquatic weeds to varying extents. Submerged weeds like Hydrilla, Najas, Ceratophyllum, Pososstemon, Potamogeton, and Vallisneria were readily consumed by the fish. Lemna and Myriophyllum were consumed to a lesser extent. Ipomoea and Eichhornia were the least preferred. For clearing 44.82 kg of a mixture of seven different weeds, five grass carp totalling in weight about 6.5 kgs were found to take about 144 hrs. For effective biocontrol of various weeds, the weed density and their growth rate should be determined; also to grass carp should be sufficiently large to escape predation in order to maintain an adequate number of fish. (Jones-Wisconsin)
W75-05058

REMOTE SENSING AS AN AID FOR MARSH MANAGEMENT - LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Environmental Engineering.
J. G. Ragan, J. H. Green, and C. A. Whitehurst.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-26912, $3.75 in paper copy, $2.25 in microfiche. March 1974. 28 p, 12 fig, 4 tab, 7 ref. NASA Grant No. 19-001-097 and 19-001-024.

Descriptors: *Marshes, *Marsh management, *Coastal marshes, *Remote sensing, Tidal marshes, Marsh plants, On-site investigations, Aquatic habitats, Weirs, Aerial photography.

NASA aerial photography, primarily color infrared and color positive transparencies, was used in a study of marsh management practices and in comparing managed and unmanaged marsh areas. Interpretations of the aerial photography were compared with ground observations. It was determined that with proper management techniques Louisiana's marshes can be improved by providing stable habitats for desirable vegetative associations and their associated fauna. Weir locations for tidal control were recommended. Aerial photography was found to be an aid in the study of marshes. (Sims-ISWS)
W75-05095

A PROCEDURE FOR AUTOMATED LAND USE MAPPING USING REMOTELY SENSED MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05096

KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W75-05110

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME I,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W75-05123

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME II,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W75-05124

GEOECOLOGY INFORMATION SYSTEM, PART I. BIOGEOGRAPHIC MAPPING OF SPECIES RANGES: DOCUMENTATION OF INPUT AND DATA CHECKING PROCEDURE FOR COMPUTER STORAGE AND RETRIEVAL OF INFORMATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 7C.
W75-05129

TO DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES,
Maine Dept. of Transportation, Augusta. Bureau of Highways.
E. G. Stoeckeler, R. S. Farrell, and R. G. Woodman.
Available from the National Technical Information Service, Springfield, Va 22161 as NASACR 139037, $4.75 in paper copy, $2.25 in microfiche. Report No. 8, March 15, 1974. 55 p, 17 fig, 11 tab, 7 ref. NAS 5-21772,MMC 203.

Descriptors: *Remote sensing, *Land use, *Floods, *Hydrology, *Aerial photography, Highways, Drainage, Watersheds(Basins), Flood plains, Forests watersheds, Precipitation(Atmospheric), Wetlands, Swamps, Runoff, *Maine.
Identifiers: *ERTS-1, *Sunkhaze Stream(Maine).

The 101 square mile watershed of Sunkhaze Stream was studied in detail by using standard airphoto interpretation techniques with ERTS imagery, U-2 RC 10 photography, and Maine Department of Transportation airphotos. Stereo viewing of ERTS imagery was preferred throughout the study for gaining detail. The sidelap area of adjacent orbits was studied stereoscopically as were various band and season combinations. Tracings of ERTS features were made from 1:125,000 scale projections for direct overlay on RC-10 transparencies. A variance of about six percent was computed for hydrologic studies prepared from standard USGS 15 minute quadrangle maps, U-2 9 inch photography and ERTS imagery. Comparable results were obtained from color infrared RC 10 transparencies and simulated ERTS color infrared products in preparing land use maps. Thirty-eight square miles of spring flooding in the Penobscot River valley were detected and measured on 23 April 1973 imagery, which is being utilized to study flooding problems in the town of Bradley. Repetitive ERTS coverage

during all seasons is a necessity for obtaining accurate hydrologic and land use data. Color infrared ERTS imagery added significantly to the resolution of detail for hydrologic studies and land use mapping. (Sims-ISWS)
W75-05130

RESEARCH IN REMOTE SENSING OF AGRICULTURE, EARTH RESOURCES, AND MAN'S ENVIRONMENT,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W75-05132

HYDROLOGICAL BASIS FOR FORECASTING AND CALCULATING RUNOFF BY SPACE IMAGES OF THE EARTH'S SURFACE,
Kanner (Leo), Associates, Redwood City, Calif.
G. P. Kalinin.
Available from the National Technical Information Service, Springfield, Va. 22161, as N74-25889, $3.75 in paper copy, $2.25 in microfiche. NASA TT-F 15665, May 1974, 41 p, 2 tab, 42 ref. Translated from Gidrologicheskiye Osnovy Prognoza i Rascheta Stoka po Aerokosmicheskim Snimkam Zemnoy Poverkhnosti, Unpublished Manuscript, Academy of Sciences, Moscow (USSR), 53 p, 1974. NASW-2481.

Descriptors: *Remote sensing, *Hydrology, *Runoff forecasting, *Runoff, Surface waters, Groundwater, Satellites(Artificial), Aerial photography, Floods, Snow cover, Mathematical models.

Procedures were outlined for applying generally accepted hydrological equations to determine runoff from parameters that can be derived from satellite or aerial photography. Some of these parameters are the area of coverage of the surface with water, the surface area of the river network, and the soil moisture content. Some American studies of the use of remote sensing for runoff prediction were described. Further problems in the investigation of processes of formation of runoff by use of aerial and space photographs were listed. (Sims-ISWS)
W75-05135

DISCHARGE OF SELECTED RIVERS OF CANADA.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2E.
W75-05136

DISCHARGE OF SELECTED RIVERS OF CANADA, SUPPLEMENT 1.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2E.
W75-05137

WATER RESOURCES DEVELOPMENT, 1950-1965, AN INTERNATIONAL BIBLIOGRAPHY,
Center of Scientific and Technological Information, Tel Aviv (Israel). Library Services.
For primary bibliographic entry see Field 10B.
W75-05154

MODELING THE HYDROLOGIC EFFECTS RESULTING FROM LAND MODIFICATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W75-05189

BHUMIBOL RESERVOIR-SEDIMENT STATUS AFTER EIGHT YEARS OF OPERATION,
Electricity Generating Authority of Thailand, Nonthaburi.
For primary bibliographic entry see Field 2J.
W75-05195

AN APPROACH TO THE SEDIMENT YIELD ESTIMATION BY SPECTRAL ANALYSIS OF MOUNTAIN RELIEF,
Gifu Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-05197

TECHNIQUES OF MEASUREMENT OF SILT DEPOSITION IN VICTORIAN RESERVOIRS,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 2J.
W75-05198

ESTIMATING AVERAGE SEDIMENT YIELDS FROM ANNUAL STREAMFLOW AND SEDIMENT RECORDS,
Geological Survey, Fort Collins, Colo.
C. F. Nordin, and G. V. Sabol.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 93-104, 5 fig, 2 tab, 4 ref.

Descriptors: *Sediment yield, *Streamflow, *Correlation analysis, *Estimating equations, *Streamflow forecasting, Sedimentation rates, Sediment discharge, Equations, Statistical methods, Variability, Sedimentology, Frequency analysis, Synthetic hydrology, Sediment load, Markov process.
Identifiers: Extending records, Double mass curves.

Generally, streamflow records extend longer in time than sediment records. Where simultaneous streamflow and sediment discharge records are available, mathematical relations between annual streamflow and annual sediment loads can be developed. These relations can be used to estimate annual sediment yield and long-term average sediment yield for periods when only streamflow records are available. The relative information content of the mean, defined as the rati of variance of the mean for a random series of annual sediment loads to variance of the mean for non-random, or autocorrelated, series of annual sediment loads, served as a criterion to determine whether or not estimates of long-term average sediment yields could be improved by estimating sediment loads from the linear relation. Twenty-four simultaneous records of annual water and sediment discharges were examined to determine if estimates of long-term average sediment discharges could be improved by extending the sediment records, based on a linear relation between sediment discharge and water discharge, to periods during which only water discharges were available. It was concluded that a linear relation between the logarithms of the values should be used to extend the sediment records, and the estimates of the long-term mean sediment discharges would be improved for all cases considered when consistent relations exist between sediment and water discharge. (See also W75-05192) (Prickett-ISWS)
W75-05200

SEDIMENT EQUILIBRIUM CONSIDERATIONS IN THE DESIGN OF IRRIGATION CANAL NETWORKS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-05252

THE HISTORY OF SEDIMENT YIELD AND DEPOSITION OF THE JUBONES RIVER, ECUADOR, AND ITS RELATION TO ENGINEERING PROJECTS,
For primary bibliographic entry see Field 2J.
W75-05257

FLOOD FLOW FREQUENCY TECHNIQUES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 2E.
W75-05262

DEMONSTRATION OF THE SEPARATION AND DISPOSAL OF CONCENTRATED SEDIMENTS,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W75-05312

OPTIMAL EXPANSION OF A WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05315

FORMULATING THE PROBLEM OF THE OPTIMAL EXPANSION OF AN EXISTING WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05317

A PROCEDURE FOR SOLVING THE OPTIMAL EXPANSION PROBLEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05318

APPLICATION OF THE OPTIMIZATION ALGORITHM TO A WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05319

THE SENSITIVITY OF PLANNING DECISIONS IN RIVER BASIN MANAGEMENT,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05320

4B. Groundwater Management

DIGITAL SIMULATION OF HORIZONTAL SALT-WATER ENCROACHMENT INDUCED BY FRESH-WATER PUMPING,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2L.
W75-04875

RECONNAISSANCE RESISTIVITY SURVEY AROUND A BRINE POND, ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
H. Lazreg.
Water Resources Branch, Scientific Series, No 42, 1974, 8 p, 3 ref, 6 fig.

Descriptors: *Resistivity, *Surveys, Saline water, On-site investigations, Aquifers, Analytical

techniques, *Canada, Brines, Inflitration, *Saline water intrusion, Water pollution sources.
Identifiers: *Brine ponds, Waste disposal ponds, Esterhazy(Saskatchewan-Canada).

A surface resistivity profiling with current electrode spacings of 40m and 100m was conducted around a brine pond generated by waste disposal of salt from a potash mine in Saskatchewan. The results of the survey indicate that salt water infiltration into the subsurface materials in the immediate vicinity of the northeastern edge of the brine pond is a possible explanation of at least one and possibly two observed conductive anomalies. (Economic Canada)
W75-04883

THE GEOCHEMISTRY OF CERTAIN MINE AND SPRING WATERS, WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 5B.
W75-04938

SEEPAGE-ENVIRONMENTAL ANALYSIS OF THE SLIME ZONE OF A TAILING POND,
Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
For primary bibliographic entry see Field 5B.
W75-05115

THREE-DIMENSIONAL SUBSURFACE DELINEATION VIA A NOVEL METHOD FOR DETERMINING THE SUBSURFACE ELECTRICAL PROFILE,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2F.
W75-05116

GEOHYDROLOGIC RELATIONSHIPS IN WATER POLLUTION,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W75-05128

GROUNDWATER IN PERMAFROST REGIONS OF CANADA,
Department of the Environment, Calgary (Alberta). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W75-05150

HYDROGEOLOGY OF THE LETHBRIDGE-FERNIE AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-05151

REGIONAL CHEMISTRY AND WATER LEVEL DISTRIBUTION OF THE NEAR-SURFACE GROUNDWATERS OF THE EDMONTON AREA (NORTHWEST SEGMENT), ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-05152

HYDROGEOCHEMISTRY OF CARBONATE GROUNDWATERS OF AN URBAN AREA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2F.
W75-05163

THE GEOLOGY AND HYDROGEOLOGY OF THE NEW LEAD BELG, MISSOURI,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 2F.
W75-05175

AQUATHERMAL FLUID MIGRATION,
Imperial Oil Ltd., Calgary (Alberta).
K. Magara.
The American Association of Petroleum Geologists Bulletin, Vol 58, No 12, p 2513-2516, December 1974. 2 fig, 7 ref.

Descriptors: *Sedimentary rocks, *Pore water, *Organic compounds, Pore pressure, Compaction, Pressure, Temperature, Porosity, Geology, Migration, Expansion.
Identifiers: Geothermal gradients.

A given weight of water expands in volume with increase of subsurface temperature during burial. The expansion may contribute to water movement from deep sections to shallow, or from the basin center to the margins, and thus could be a contributing factor in hydrocarbon migration. The higher the geothermal gradient, the more water expansion can be expected; a high geothermal gradient favors fluid migration and possible flushes more hydrocarbons. Where the geothermal gradient is constant, the rate of water expansion increases with depth of burial. Therefore, water expansion becomes increasingly important at depths necessary for the generation of hydrocarbons. In a geologic model of shale-sandstone interbeds, where the shales have the greater porosity and hence contain a greater volume of water, the expansion resulting from burial would cause water to move out of the shales and into the sandstones. This movement, therefore, could help the migration of hydrocarbons from shales to sandstones. (Schicht-ISWS)
W75-05182

MANAGEMENT OF WASTE FLUIDS IN SALAQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-05191

INVESTIGATION OF ALTERNATIVE PROCEDURES FOR ESTIMATING GROUNDWATER PARAMETERS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. McLaughlin.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 952, $7.00 in paper copy, $2.25 in microfiche. Completion Report, January 1975. 182 p, 19 fig, 10 tab, 25 ref, 8 append. OWRT C-4238(No. 9035)(1).

Descriptors: *Groundwater basins, *Optimization, Simulation analysis, Statistics, *Estimating, *Model studies, *California, Calibration, Forecasting, Reviews, Measurement.
Identifiers: Model calibration, Kalman filtering, Parameter estimation, *San Jacinto groundwater basin(Calif).

The objective was development of an improved technique for automatically calibrating groundwater basin simulation models. The research consisted of four major tasks: (1) A critical review of available literature identified three promising parameter estimation techniques which may be used to calibrate groundwater simulation models; (2) The capabilities of each of the three selected techniques were evaluated, both analytically and experimentally, and computational refinements were made where appropriate; (3) The best overall parameter estimation technique was tested on a 179 parameter model of the San Jacinto groundwater basin in Southern California; (4) An investigation was made of problems caused by uncertain calibration measurements. Results indicated that an iterative nonlinear programming algorithm (Gauss' algorithm) is the best available groundwater model calibration technique. A preliminary analysis suggests that the detrimental effects of uncertain calibration measurements can be reduced by the use of a statistical technique known as Kalman filtering.
W75-05263

SEEPAGE FLOWS - GROUNDWATER POLLUTION INVESTIGATIONS,
Rutgers - The State Univ., New Burnswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-05273

FLOW PATTERNS OF STEADY RAINFALL SEEPING THROUGH BEDDED LAND OR A HILLSIDE WITH A BARRIER AT GREAT DEPTH,
Virginia Polytechnic/Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 2F.
W75-05339

4C. Effects On Water Of Man's Non-Water Activities

HYDROLOGIC ASPECTS OF A LOW FLOW WATER MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 4A.
W75-04862

FACTORS AFFECTING POTENTIAL EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2D.
W75-04916

EFFECT OF VEGETATION ON STORM HYDROGRAPHS,
Agricultural Research Service, Coshocton, Ohio. Soil and Water Conservation Research Div.
L. L. Harrold.
In: Biological Effects in the Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Inidana, p 332-346. 6 fig, 3 tab, 16 ref.

Descriptors: *Storm runoff, *Vegtation effects, *Hydrographs, Vegetation, Forests, Reforestation, Vegetation regrowth, Retardance, Runoff, Infiltration, Soil surfaces, Surface runoff, Water yield, Canopy, Watersheds(Basins), Rainfall-runoff relationships, Discharge(Water), Peak discharge.
Identifiers: *Storm Hydrograph, *Runoff peak rates, Woodland.

Ten years of research results at several research centers was evaluated, and selected results were used to evaluate analytical methods and show the influence of catchment characteristics. Complete vegetative cover tended to maintain high rates of infiltration, resulting in low rates of storm runoff, providing there was enough soil-water storage potential to absorb volumes of water during the storm period. Complete vegative cover, through evapotranspiration, extracted soil water and increased the potential volume of storm rainfall retention as compared with fallow. Twenty years after planting trees on a Tennessee catchment a flood peak of 0.02 cu m/sec would have been 3 cu m/sec without reforestation. Before reforestation, 94% of the total storm flow occurred within 1 hour

after flow started. Fifteen years later, the 94% value was reached after 20 hours of flow. The hydrographs flattened, peaks were less, and stormflow persisted longer: the effects of a drastic change in vegetation that increased storm rainfall infiltration potential. (See also W75-03023) (Roberts-ISWS)
W75-04926

THE INFLUENCE OF VEGETATION AND VEGETATIVE MULCHES ON SOIL EROSION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
L. D. Meyer, and J. V. Mannering.
In: Biological Effects In The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 355-366. 4 tab, 33 ref.

Descriptors: *Soil erosion, *Vegation effects, *Erosion control, *Land management, Soil stabilization, Wind erosion, Cultivated lands, Retardance, Mulching, Erosion rates, Water control, Soil surfaces, Watershed management.

The vegetation characteristics of a watershed very strongly influence its runoff and erosion response. Dense and vigorous vegetation was one of the best practices for protecting land from excessive soil erosion. When land was not covered by growing plants, surface mulches of plant residues were very effective. Wise management of vegetation and vegetative residues can greatly reduce water and air pollution from one of our Nation's major contaminates, eroded soil. Tabulated data showed: (1) Influence of type, rate and management of crop residues on wind erosion; (2) Influence of mulch rate on erosion by water; (3) Relative erodibilities for several crop sequences; and (4) Relative erosion from slopes. (See also W75-03023) (Humphreys-ISWS)
W75-04928

WATER QUALITY AFTER CLEARCUTTING A SMALL WATERSHED IN WEST VIRGINIA,
Forest Service (USDA), Parsons, W. Va. Timber and Watershed Lab.
G. M. Auberton, and J. H. Patric.
Journal of Environmental Quality, Vol 3, No 3, p 243-249, July-September, 1974. 2 fig, 3 tab, 13 ref.

Descriptors: *Age, *Turbidity, *Forestry, *Streamflow, *Nutrients, *Clear-cutting, Temperature, Agriculture, Watersheds(Basins), Water management(Applied), Hydrogen ion concentration, *West Virginia, Water quality.
Identifiers: Fernow Experimental Forest(Parsons-West Virginia).

In 1969, an 85-acre watershed was clearcut on the Fernow Experimental Forest, Parsons, West Virginia. As a result of the clearcutting, streamflow increased; this increase was reduced during the second year by rapid revegetation. Clearcutting had a negligible effect on the temperature, pH, nonstorm turbidity, and concentrations of dissolved solids. Storm turbidity, nitrate-nitrogen and phosphate concentrations showed slight increases. Water quality remained high due to careful road management, retention of forest along the stream, and lush vegetation regrowth after cutting. (Carpenter-FIRL)
W75-04998

ANALYSES OF THE EFFECT OF URBANIZATION ON RAINFALL CHARACTERISTICS I,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. A. Rao, and R. G. Srinivasa Rao.
Available from the National Technical Information Service, Springfield Va. 22161, as PB-239 871, $7.25 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center; Technical Report No 50, 1974. 156 p, 21 fig, 42 tab, 43 ref, 3 append. OWRT B-025-IND (3).

Descriptors: *Urban sociology, *Rainfall, Statistical methods, Statistical Models, *Urbanization, Model studies, Cities.

The study deals with testing the significance of observed changes in precipitation in an around urban areas. The data from St. Louis, Missouri, LaPorte, Indiana, Tulsa, Oklahoma, and Kansas City, Missouri were analyzed. Several statistical tests were used in analyzing the data. The assumption was made that the annual data are independent and identically distributed random variables and analyzed by using the multivariate and univariate tests. As a by-product of this analysis, the minimum number of observations required to estimate a given change in the mean was estimated. The main conclusions are (1) the observed increases in the monthly and annual rainfall in and around urban areas are statistically significant in many instances. The observed increase in LaPorte rainfall is definitely significant. (2) These increases do not occur in only warm or in the cold seasons. (3) The tests based on time series models are better than multivariate and univariate tests based on the independent and identically distributed assumption. The availab[illegible]e length of data from any station in the affected period is sufficient to carry out various statistical tests to obtain reliable results.
W75-05172

INVESTIGATION OF ENRICHMENT OF MOLYBDENUM IN THE ENVIRONMENT THROUGH COMPARATIVE STUDY OF STREAM DRAINAGES, CENTRAL COLORADO,
Colorado Univ., Boulder. Dept. of Geological Science.
For primary bibliographic entry see Field 5B.
W75-05293

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-05306

SECOND ANNUAL REPORT, DOT-CIAP PROGRAM,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2B.
W75-05349

4D. Watershed Protection

SOUTHERN TIER EAST REGION, BROOME-TIOGA COUNTIES, NEW YORK COMPREHENSIVE DRAINAGE STUDY, REPORT SUMMARY,
For primary bibliographic entry see Field 4A.
W75-04858

EXTENSION OF HYDROLOGIC PROCESS MODELING TO TOTAL WATERSHED MODELING,
Agricultural Research Services, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W75-04924

THE INFLUENCE OF VEGETATION AND VEGETATIVE MULCHES ON SOIL EROSION,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4C.
W75-04928

WATER QUALITY OF THREE SMALL WATERSHEDS IN NORTHERN UTAH,
Forest Service (USDA), Logan, Utah. Forest Sciences Lab.
For primary bibliographic entry see Field 5B.
W75-04943

A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME I: SUMMARY REPORT.
IBM Federal Systems Div., Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W75-05108

A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME II: SUPPORTING TECHNICAL DETAILS.
IBM Federal Systems Div., Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W75-05109

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEMS STUDIES, VOLUME III,
Tennessee Univ., Knoxville. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W75-05125

BIBLIOGRAPHIES PERTINENT TO WILDLAND HYDROLOGY,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 10C.
W75-05153

EXPERIMENTAL STUDY OF RILL EROSION,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-05178

AIR PRESSURES OVER SURFACES EXPOSED TO WIND - I. WATER HARVESTING CATCHMENTS,
Agricultural Research Service, Water Conservation Lab. Phoenix, Ariz.
For primary bibliographic entry see Field 3B.
W75-05179

MODELING THE HYDROLOGIC EFFECTS RESULTING FROM LAND MODIFICATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W75-05189

SEDIMENT CONTROL AND REMEDIAL WORKS IN THE BRANTAS RIVER, JAVA, INDONESIA,
Ministry of Public Works, Djakarta (Indonesia). Directorate General of Water Resources.
S. Doelhomid.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 213-226. 5 fig, 1 tab.

Descriptors: *Volcanoes, *Flood control, *Sediment control, *Mudflows, Sediment transport, Embankments, River beds, Aggradation, Drainage, Gradients(Streams), Alluvial fans, Equilibrium, Silting, Tunnels, Rivers, Craters.
Identifiers: *Indonesia(Brantas River), Mt. Kelud(Java), Lahars, Volcanic debris, Pyroclastic materials.

The behavior of the 320 km long Brantas River in East Java is largely dominated by the inflow of

volcanic debris from Mt. Kelud which has an eruption cycle of about 15 years. This debris is not all transported to the sea and in consequence there has been a gradual overall rise in river bed levels, which in the past century have been accelerated by man who has confined the river between flood embankments. The continued formation of an alluvial plain through flood spill, particularly in the Middle Brantas, has thus been prevented and now there are some reaches where the bed level is meters above the adjacent plain. The basic problem is flood prevention, and the solution lies in sediment control. Three broad approaches were considered: (1) preventing or reducing sediment inflow, (2) diverting sediment from the river, and (3) increasing sediment transport to the sea. Within each approach there are various engineering alternatives, and the solution must be a combination of alternatives, implemented as a phased program. A thorough understanding of the basin hydrology and river hydraulics is essential before firm solutions can be established. The required data is sparse and a continued program of detailed observations is necessary. (See also W75-05192) (Visocky-ISWS)
W75-05211

LANG LANG RIVER, VICTORIA ATTEMPTS TO CONTROL SEDIMENT, EROSION AND FLOODS,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
D. T. Currey.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 227-239. 10 fig, 2 ref.

Descriptors: *Stream erosion, *Flood damage, *Flood control, Erosion, Stream stabilization, Gradients(Streams), Embankments, Levees, Swamps, Drainage, Erosion control, Weirs, Drains, Bank erosion, Channels, Equilibrium, Sheet piling, Overfalls, Australia.
Identifiers: *Australia(Lang Lang River), Lang Lang River(Koo-wee-rup Swamp).

The Koo-wee-rup Swamp reclamation works constitute the most important swamp drainage scheme in Victoria. Drainage works were commenced in 1885, but it was not until 1917 that a comprehensive drainage scheme for a 23,500 hectare area was provided. A herringbone bone system of drains was effective in draining the area but was not able to cope with flood overflows from the Lang Lang River. Despite extensive river improvement works over the last 57 years, including an 18 km channel, rapid erosion is occurring, especially in the central portion of the river which is a sloping plain. An embankment and a levee constructed across the path of flood overflows were suggested as the prime structures leading to the bed and bank erosion. In 1964 two bridges were threatened by undermining from headward erosion. Two low overfall weirs were constructed as grade-reducing structures near the upper bridge and proved successful in preventing further erosion there. Similar structures near the lower bridge failed, however, and undermining made the bridge unserviceable by 1971. Costs of two alternative solutions are being considered: (1) allow erosion to continue until an equilibrium is reached, or (2) build structures that would drown the erosion heads. (See also W75-05192) (Visocky-ISWS)
W75-05212

GTWS: GEORGIA TECH WATERSHED SIMULATION MODEL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-05271

PREDICTION OF SUBSOIL ERODIBILITY USING CHEMICAL, MINERALOGICAL AND PHYSICAL PARAMETERS,
Purdue Research Foundation, Lafayette, Ind.
For primary bibliographic entry see Field 2J.
W75-05308

AN EXECUTIVE SUMMARY OF THREE EPA DEMONSTRATION PROGRAMS IN EROSION AND SEDIMENT CONTROL,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W75-05310

PROGRAMMED DEMONSTRATION FOR EROSION AND SEDIMENT CONTROL SPECIALISTS,
Hittman Associates, Inc., Columbia, Md. Environmental and Geosciences Dept.
For primary bibliographic entry see Field 5G.
W75-05311

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ANALYTICAL METHODS MANUAL - MANUEL DES METHODES ANALYTIQUES,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
1974, (90 p).

Descriptors: *Analytical techniques, *Methodology, *Testing, *Water quality, *Sediments, Analysis, Properties, Evaluation, Organic compounds, Pesticides, Herbicides, Turbidity, Measurement, Inorganic compounds, Hydrogen ion concentration, *Pollutant identification.
Identifiers: Manuals, Minerals.

This manual describes and updates methods and procedures used in the Water Quality Branch analytical laboratories, for analysing waters and other media such as wastes and sediments associated with water systems. The manual is divided into two parts; (1) Inorganic Constituents, such as metals, minerals, chemicals, pH, and Turbidity; and (2) Organic consitituents such as pesticides, herbicides and pentachlorophenol. (Environment Canada)
W75-04870

INTERLABORATORY QUALITY CONTROL STUDY NO 6: SPECIFIC CONDUCTANCE, PH, COLOUR AND RESIDUE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2K.
W75-04887

MODIFIED PROCEDURE FOR THE DETERMINATION OF PHOSPHORUS IN DETERGENTS,
Environmental Protection Service, Ottawa. (Ontario). Water Pollution Control Directorate.
P. D. Goulden, and M. C. Holton.
Technology Development Report EPS4-WP-74-2, March 1974. 20 p, 9 fig, 1 tab.

Descriptors: Research and development, *Detergents, *Phosphorus, *Analytical techniques, Methodology, Testing procedures, Investigations, Chemistry, Analysis, Chemical analysis, *Pollutant identification.

The procedure described by the American Society for Testing and Materials for the determination of phosphorus in detergents has been studied. It is concluded that, at 5% phosphorus as P205, the method as written does not give a true measure of the phosphorus level. A modified titrimetric procedure has been developed which overcomes the difficulties experienced in the ASTM procedure at low phosphorus levels. (Environment Canada)
W75-04888

TECHNIQUES FOR TRACING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-04889

FURTHER STUDIES ON THE HEAVY METAL LEVELS IN OTTAWA AND RIDEAU RIVER SEDIMENTS,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
B. G. Oliver, and H. Agemian.
Environment Canada, Inland Waters, Directorate, Scientific Series No 37, Ottawa, Ontario, Canada, 10 p, 10 ref, 4 fig, 3 tables, 1974.

Descriptors: *Sediments, *Heavy metals, Sampling, *Chemical analysis, Mercury, Lead, Industrial wastes, Sewers, Data collections, Zinc, Copper, Nickel, *Canada, *Pollutant identification.
Identifiers: *Ottawa River(Canada), Ontario, *Rideau River(Canada), Atomic absorption, Snow disposal.

Sediment samples, collected at two-mile intervals on the Ottawa and Rideau Rivers in the summer of 1972, were analyzed for lead, mercury, zinc, copper, nickel, cobalt, iron, manganese, chromium, and cadmium by atomic absorption spectrophotometry. Unusually high levels of mercury were recorded near pulp and paper industrial discharges as a result of former use by the industry of mercurial slimicides. Elevated metal levels were found at sewage plant and storm sewer outfalls. This is to be expected as sewage contains a significant quantity of metals, especially in the particulate form. The removal of snow disposal sites away from the Rideau River lowered the lead sediment levels in this river in the city of Ottawa. (See also W73-07588) (Environment Canada)
W75-04890

TRACE ELEMENT DETERMINATIONS ON LAKE MICHIGAN TRIBUTARY WATER SAMPLES USING SPARK SOURCE MASS SPECTROMETRY.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W75-04910

REMOTE SENSING POTENTIALS FOR RESOURCE MANAGEMENT,
Purdue Univ., Lafayette, Ind. Dept. of Forestry and Conservation.
R. M. Hoffer.
In: Biological Effects in The Hydrological Cycle, Proceedings of The Third International Seminar for Hydrology Professors, July 18-30, 1971, Purdue University, West Lafayette, Indiana, p 211-227. 9 fig, 1 tab, 18 ref. NASA Grant NGL 15-005-112.

Descriptors: *Remote sensing, *Analytical techniques, *Aerial photography, *Electromagnetic waves, *Reflectance, *Water quality control, Vegetation effects, Heated water, Land resources, Data processing.
Identifiers: *Optical-mechanical scanner, Spectral variations.

The manner in which we will be utilizing our resources during the next few decades and beyond depends largely on the decisions on use of these

resources. These decisions will be influenced by the amount and detail of information available about the various land and water areas. Remote sensing increases our ability to collect data at frequent intervals over vast geographic areas. It is a developing technology involving the acquisition of data about a portion of the earth's surface by using sensing devices operated from a remote location, usually from an aircraft or a spacecraft. Remote sensing has already proved to be a very useful tool in several areas of application in the management of out natural resources, and the potential applications seem almost unlimited. Further developments in the handling of spatial and temporal data, in addition to spectral data, will bring significant improvements in automatic data analysis. Even though major improvements in automatic data analysis techniques will be achieved, man's contributions will always be required in the analysis of remote sensor data. The need for accurate and detailed manual photo interpretation in many application areas will continue to be a major requirement. (See also W75-03023) (Singh-ISWS)
W75-04922

HANDBOOK OF ENVIRONMENTAL CONTROL. (1) AIR POLLUTION. (2) SOLID WASTE. (3) WATER SUPPLY AND TREATMENT. (4) WASTEWATER: TREATMENT AND DISPOSAL,
Minnesota Univ., Minne. Div. of Environmental Health.
For primary bibliographic entry see Field 5D.
W75-04945

INDIGESTER BLACK LIQUOR OXIDATION FOR ODOR CONTROL IN KRAFT PULPING,
North Carolina State Univ., Raleigh. Dept. of Wood and Paper Science.
For primary bibliographic entry see Field 5G.
W75-04952

IDENTIFICATION OF PETROLEUM PRODUCTS IN NATURAL WATER BY GAS CHROMATOGRAPHY,
New York State Dept. of Health, Albany.
R. Dell'Acqua, J. A. Egan, and B. Bush.
Environmental Science and Technology, Vol 9, No 1, p 38-41, Jan 1975. 6 fig, 10 ref.

Descriptors: *Oil wastes, Natural streams, *Pollutant identification, *Gas chromatography, *Water analysis, Water properties, Trace elements, Bodies of water, Springs, Chromatography, Analytical techniques, Oil, Oily water, Water pollution sources, Water pollution.
Identifiers: Kerosine, Diesel fuel, Fuel oil, Transmission fluid, Lubricating oil, Port of Albany(NY).

Gas chromatography on high-efficiency packed columns is suitable for the rapid identification of trace quantities of common petroleum products. Concentrations as low as 0.25 microliter/liter of the contaminants may be extracted and identified. Chromatograms of kerosine, diesel fuel, common fuel oils, transmission fluid, and lubricating oils are given. Three examples of the use of the method in differentiating fuel oils from different manufacturers, and in determining petroleum residues in water from the Port of Albany and in springwater from Albany County, New York, are described. (Witt-IPC)
W75-04967

A MODIFIED FLUOROMETRIC METHOD FOR MEASUREMENT OF LIGNIN SULFONATES AND ITS IN SITU APPLICATION IN NATURAL WATERS,
National Swedish Environment Protection Board, Uppsala.
A. Wilander, H. Kvarnas, and T. Lindell.
Water Research, Vol 8, No 12, p 1037-1045, Dec 1974. 10 fig, 3 tab, 15 ref.

Descriptors: Natural streams, *Fluorometry, *Lignins, *Pollutant identification, *Water analysis, Analytical techniques, Chemical analysis, Water properties, Water pollution sources, Pollutants, Pulp wastes, Optical properties, Water quality, Humus.
Identifiers: *Lignosulfonates, Lake Vanern(Sweden).

A modified fluorometric method is described for the determination of lignosulfonates in natural waters. The optimum wavelengths for excitation and emission are 285 and 405 nm, respectively. There is little interference from natural compounds, especially humic substances. The application of the method to a filter fluorometer for in situ measurements in Lake Vanern (Sweden) is described, together with some test results. (Witt-IPC)
W75-04972

EFFECT OF CARBON TO NITROGEN RATIO ON ACTIVATED SLUDGE SUBSIDENCE AND DEWATERING CHARACTERISTICS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W75-04987

AN IMPROVED CHEMICAL DELIVERY APPARATUS FOR USE IN INTERMITTENT-FLOW BIOASSAYS,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
J. H. Chandler, Jr., H. O. Sanders, and D. F. Walsh.
Bulletin of Environmental Contamination and Toxicology, Vol 12, No 1, p 123-128, July 1974. 1 fig, 4 ref.

Descriptors: *Bioassay, *Laboratory equipment, *Pesticide toxicity, Pesticides, Equipment, *Toxicity, Aquatic life, Analytical techniques, Water pollution sources, *Pollutant identification, Monitoring, Measurement.
Identifiers: *Intermittent-flow bioassays, New equipment.

Flow-through systems for measuring toxicological and physiological effects of pesticides in aquatic organisms are an improvement over the static systems. A chemical delivery apparatus is described that is an improvement over many of the intermittent-flow toxicant systems previously devised. The apparatus does not require the use of a Mariotte bottle and is designed to replace the metering devices on existing intermittent flow systems without altering their basic function. It has no moving parts, consists of materials commonly found in well-equipped laboratories, and delivery of different volumes of toxicant is easily produced by changing the volume of the apparatus. (Orr-FIRL)
W75-04994

BIOLOGICAL ASSESSMENT OF DIESEL SPILL IN THE VICINITY OF ANACORTES, WASHINGTON, MAY 1971,
Texas Instruments, Inc., Dallas.
For primary bibliographic entry see Field 5C.
W75-05001

ESTIMATION OF HEAVY METAL POLLUTION IN TWO NORWEGIAN FJORD AREAS BY ANALYSIS OF THE BROWN ALGA ASCOPHYLLUM NODOSUM,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
A. Haug, S. Melsom, and S. Omany.
Environmental Pollution, Vol 7, No 3, p 179-192, November 1974. 3 fig, 11 tab, 17 ref.

Descriptors: *Trace elements, *Heavy metals, *Phaeophyta, *Algae, *Fjords, Zinc, Copper, Lead, Cadmium, Mercury, Water quality control, Monitoring, Bioindicators, Estuaries, Methodology, Spectrophotometry, Analytical techniques, *Pollutant identification.
Identifiers: Ascophyllum nodosum, *Norway.

The usefulness of trace element analysis of seaweeds for determining the distribution of heavy metals in fjord areas was investigated. Concentrations of zinc, copper, lead, cadmium and mercury were determined in the brown alga Ascophyllum nodosum from two Norwegian fjords. In both areas marked local variations in heavy metal concentrations in the seaweeds were observed, and in one, maximum concentrations as high as 20-50 times normal levels were found for Zn, Cu, Pb, and Cd. The highest value observed for mercury was 20 ppm of dry matter, while the normal level was below 0.1 ppm. Levels of zinc, cadmium and mercury higher than normal were observed 90 km from the main source, while copper and lead reached normal levels 35 km from the source. The results indicate that trace element analysis of seaweeds is a useful and inexpensive method for evaluating the state of a marine recipient with regard to heavy metal contamination. (Katz)
W75-05002

ORGANOCHLORINE RESIDUES IN BROWN PELICAN EGGS: RELATION TO REPRODUCTIVE SUCCESS,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5C.
W75-05006

OCCURRENCE OF DDT AND PCB COMPOUNDS IN BALTIC HERRING AND PIKE FROM THE TURKU ARCHIPELAGO,
Turku Univ. (Finland). Inst. of Biochemistry.
For primary bibliographic entry see Field 5C.
W75-05008

INDICATORS OF EUTROPHICATION: VISUAL, CHEMICAL, PHYSICAL, BIOLOGICAL,
Limnology Information and Freshwater Ecology, Inc., Carmel, N.Y.
For primary bibliographic entry see Field 5C.
W75-05046

A GUIDE TO THE MEASUREMENT OF MARINE PRIMARY PRODUCTION UNDER SOME SPECIAL CONDITIONS,
United Nations Educational, Scientific and Cultural Organization, Paris(France).
UNESCO, 7 Place de Fontenoy, Paris, France 75700, (ISBN 92-3-101099-9), 1973. 73 p, 15 fig, 16 tab, 190 ref.

Descriptors: *Measurement, *Oceans, *Primary productivity, *Methodology, Biomass, Beaches, Benthic flora, Polar regions, Estuaries, Plankton, Ice cover, Tropical regions, Oligothrophy, Euthrophication, Marine plants, Marine algae, Laboratory tests, Shores, Pollutant identification.
Identifiers: Winkler method, Seaweeds.

Ways in which the original carbon-14 technique might be modified to determine primary productivity under special conditions found in some marine environments are described. The broad definition of primary production was adopted as being the formation of organic particulate material at the primary stages of the food chain. Section 2 reviews methods for measurement of primary production of plankton in near-shore communities including eutrophied and polluted waters. In Section 3 attention is drawn to references which pertain to some special difficulties encountered in specific environments. These include primary production of smaller seaweeds using carbon-14 technique; method determining growth production of Laminaria and Agarum; primary production of

large marine algae measured in situ using C-14 uptake; a method for determining seaweed production based on biomass estimate; primary production on a sandy beach; primary production of benthic microflora; measurement of primary production under polar ice; followed by the Winkler method and primary production studies under special conditions. Section 4 deals with a number of particular problems which may be encountered. (Jones-Wisconsin)
W75-05047

AN AUTOMATIC UNDERWATER CAMERA SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. J. Jirberg.
In: Project Hypo. An Intensive Study of the Lake Erie Central Basin Hypolimnion and Related Surface Water Phenomena. Environmental Protection Agency, Fairview Park, Ohio, Technical Report TS-05-71-208-24, February 1972, p 127-132, 3 fig.

Descriptors: *Remote sensing, *Cameras, Underwater, Bottom sediments, *Hypolimnion, Lakes, *Lake Erie, Pollutant identification.

To obtain nearly continuous photographic documentation of lake bottom conditions, an automatic underwater camera system was specially designed and built for a study of the Lake Erie Central Basin hypolimnion. The camera, together with an electronic flash unit as an illumination source, sat just off the bottom in mid-Lake Erie and automatically photographed the bottom at one hour intervals. Up to 10 days of unattended operation was possible while taking up to 250 color photographs, one per hour, before retrieval and reload was required. The camera consists basically of a two-part system: one water-tight housing contained a 35 mm motor-driven camera along with the timing and control circuitry, while the other contained the flash unit. It is commercially available as a 35 mm single lens reflex camera with motorized shutter release and film advance. The View field is more nearly that of a normal (50 mm) focal length lens. At a height of 1 meter off the bottom, the view field encompassed an approximate area of 0.6 x 0.9 m vertically below the camera. The actual area photographed could be viewed by a driver through the large pentaprism finder looking directly throught the rear housing panels. Design and operational details are presented. (See also W72-12990 thru W72-12997) (Auen-Wisconsin)
W75-05048

A SUBMERSIBLE AUTOMATIC DISSOLVED OXYGEN-TEMPERATURE MONITORING SYSTEM,
Environmental Protection Agency, Fairview Park, Ohio. Ohio District Basin Office.
C. J. Beier.
In: Project Hypo. An Intensive Study of the Lake Erie Central Basin Hypolmnion and Related Surface Water Phenomena. Environmental Protection Agency, Fairview Park, Ohio, Technical Report TS-05-71-208-24, February 1972, p 133-140, 5 fig.

Descriptors: *Monitoring, *Instrumentation, *Automation, Data collections, *Dissolved oxygen, Water temperature, Underwater, *Pollutant identification, *Lake Erie, Lakes.

In the summer of 1970, following modifications, five commercially available dissolved oxygen monitors designed to measure and record in situ dissolved oxygen and temperature simultaneously on a continuous basis, were installed in five locations in the Central Basin hypolimnion of Lake Erie. There they successfully documented, for the first time, on a continuous basis, the dissolved oxygen depletion rate over a period of fifty days. The monitor is a completely submersible system comprised of three major assemblies: the instrument module, a multi-conductor cable, and the sensor module. Complete records were obtained from four of the monitors while only a partial record was obtained from one monitor due to leakage of an electrical connector. Occasionally heavy seas precluded maintaining regular servicing schedules, but in no case did this result in a loss of data. Although the power supply was designed for a minimum of eight days continuous operation, uninterrupted operation up to eleven days was suggested modifications are detailed. The monitor is considered a prototype for future monitoring systems having greatly expanded capabilities. (See also W72-12990 thru W72-12997)
W75-05049

METHODS FOR STUDIES OF PLANKTON (IN SWEDISH),
For primary bibliographic entry see Field 7B.
W75-05061

STUDIES OF LOW MOLECULAR WEIGHT LIGNIN SULFONATES,
Washington Univ., Seattle.
B. F. Hrutfiord, L. N. Johanson, J. L. McCarthy, K. Forss, and W. Glasser.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Environmental Protection Agency, Technology Series Report EPA-660/2-74-069, June 1974. 83 p, 23 fig, 4 tab, 39 ref. EPA Project 12040 DEH.

Descriptors: *Sulfonates, *Lignins, *Pulp wastes, Chemical analysis, By-products, Molecular structure, Organic wastes, *Separation techniques, Sulfite liquors, Waste identification, Pacific Northwest U.S., *Pollutant identification, Waste water treatment, Distillation.
Identifiers: Lignin sulfonate separation, Chemical composition, Spent sulfite liquor.

Low molecular weight lignin sulfonates have been separated in purified form and characterized by physiochemical and chemical methods. Their structure and reactions have been evaluated. Lignin sulfonates from the spent sulfite liquor of a mild acid bisulfite cook of Western Hemlock (Tsuga heterophylla) were purified and fractionated in Sephadex G-25 column chromatography. Samples were analyzed using acetylation of hydroxyl-groups and esterification of sulfonate-groups which aided the elimination of the polydisperse nature of the material under investigation. Complete elemental and functional group compositions were established for lignin sulfonates from a spent sulfite liquor and compared to those from milled wood lignin preparation. This allowed an estimate of the degree of sulfonation, condensation and demethylation as well. Extended separation studies indicated the low molecular weight lignin sulfonates to be the reaction product of a difunctional vinyl-type polymerization, thus accounting for the widely different properties as compared to their higher molecular weight counterparts. The feasibility of large scale separations was determined using (1) the extraction and precipitation of the dry matter in a spent sulfite liquor with alcohol, and (2) the fractionation of the material by ion exclusion in a column arrangement. (Willard-EPA)
W75-05072

AN INVESTIGATION OF ION REMOVAL FROM WATER AND WASTEWATER,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 5D.
W75-05080

PESTICIDES IN THE ILLINOIS WATERS OF LAKE MICHIGAN,
Environmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W75-05083

IMPLEMENTATION OF A COMPUTER-BASED INFORMATION SYSTEM FOR MASS SPECTRAL IDENTIFICATION,
Battelle Columbus Labs., Ohio.
J. R. Hoyland, and M. B. Neher.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.10. Environmental Protection Agency Technology Series Report, EPA-660/2-74-048, June 1974. 43 p, 18 fig, 8 ref. EPA Project 16ADN 29, EPA R-800921.

Descriptors: *Mass spectrometry, *Pollutant identification, Organic compounds, *Computer programs, Data processing.
Identifiers: *Mass spectra, Computer identification(Pollutants).

A computer program has been developed for remote identification of mass spectra. Careful software design has led to a powerful and efficient system with minimum dialog and a highly flexible data input routine. Users may either access the main spectral library or create special libraries of their own. In addition, programs have been developed for the PDP-8/e or PDP-8/m computer of the System/150 to abbreviate spectra, punch spectra on tape, or to send spectra directly from the PDP-8 via a serial line interface. (EPA)
W75-05085

SHRIMP CANNING WASTE TREATMENT STUDY,
Domingue, Szabo and Associates, Inc., Lafayette, La.
A. F. Mauldin, and A. J. Szabo.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $2.05. Environmental Protection Agency, Technology Series Report, EPA-660/2-74-061, June 1974. 130 p, 31 fig, 38 tab, 18 ref, 4 append. S 800 904.

Descriptors: *Waste water treatment, *Monitoring, Screens, *Flotation, Sludge, Dewatering, Costs, Optimization, *Industrial wastes, Canneries, Treatment facilities, Surveys, Pilot plants.
Identifiers: *Shrimp processing wastewaters, *Dissolved air flotation.

Wastewater surveys were performed at several Gulf shrimp canneries over a period of three canning seasons. Water used for each process within the plant was metered and the wastewater was tested for biological, chemical and physical characteristics. Pilot screening tests were made over two canning seasons. Tangential, rotary and vibrating screens were evaluated. A 272 cu m/day (50 gpm) dissolved air flotation pilot plant with chemical addition and pH control was tested at the study plant over two canning seasons. A pilot basket centrifuge was evaluated for sludge dewatering. The study demonstrated that: (1) the waste poundage discharged per pound of raw shrimp processed is similar in most Gulf shrimp canning plants; (2) screening removal of heads and shells can be performed efficiently and with few operational problems; and (3) air flotation showed promise as a wastewater treatment method. When performing properly, treatment efficiencies were good, however, the operation was sensitive and treatment efficiencies that can be expected on a plant scale remain to be demonstrated. (EPA)
W75-05087

MEASUREMENT OF RESIDUAL CHLORINE LEVELS IN COOLING WATER--AMPEROMETRIC METHOD,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
R. M. Manabe.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.10. Environmental Protection Agency, Technology Series Report, EPA-660/2-

73-039, August 1974. 45 p, 6 fig, 14 tab, 14 ref, append. EPA Program Element 1BB392, ROAP 21AZU, Task 23.

Descriptors: *Chlorine, Chlorination, Chemical analysis, *Polarographic analysis, Water treatment, *Cooling towers, Pollutant identification, Measurement.
Identifiers: Cooling systems, *Amperometric method.

Modifications are described of the amperometric titration method for chlorine residuals in cooling tower blowdowns or other water systems with a high degree of metal ion content along with other dissolved and suspended solids. The addition of sodium pyrophosphate as a blanket complexing agent appears to remove successfully the heavy metals interferences contributed by Fe and Cu in the blowdown matrix. Recommendations are made to increase the efficiency of both sampling and the actual titration procedure in order to allow a residual determination in the minimum amount of time. Equipment recommendations along with a design of a biamperometric endpoint system which allows greater titration speed along with portability are described. (Nelson-EPA)
W75-05088

A METHOD FOR THE SEPARATION OF OIL FROM AN AQUEOUS OIL-DETERGENT SOLUTION PRIOR TO IR ANALYSIS,
Naval Ordnance Lab., White Oak, Md.
C. E. Adams.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 703, $3.25 in paper copy, and $2.25 in microfiche. Report No. NOLTR 74-102, July 19, 1974. 10 p, 1 tab.

Descriptors: *Separation techniques, *Oil, *Detergents, Oily water, Oil pollution, Chemical analysis, Chromatography, Aqueous solutions, Analytical techniques, *Pollutant identification.
Identifiers: *Infrared analysis.

A procedure was devised to permit the analysis of oil in water solutions in the presence of dissolved detergents by using the carbon tetrachloride extration-IR spectrophotometric method. After an initial extraction of the aqueous oil-detergent solution with carbon tetrachloride, the extract was evaporated on a silica gel column and eluted with carbon tetrachloride. This procedure effectively removed all the detergent and allowed an interference-free analysis of the carbon tetrachloride-oil solution with the IR spectrophotometer. About 10% of the initial oil was lost in the procedure. (Sims-ISWS)
W75-05098

DEVELOPMENT OF A FIXED SITE SURFACE FILM OIL SAMPLER,
Curtis-Le Vantine and Associates, Tarzana, Calif.
A. D. Le Vantine, and D. L. Curtis.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 106, $5.25 in paper copy, $2.25 in microfiche. Report No CG-D-102-74, April 1974. 100 p, 35 fig, 1 tab, 1 ref, 6 append. DOT-CG-31,971A.

Descriptors: *Sampling, *On-site data collections, *Oil pollution, *Oily water, Adsorption, Weirs, Equipment, Coasts, Estuaries, *Pollutant identification.
Identifiers: Polyurethane.

A development program was undertaken to construct and test a surface film oil sampler buoy capable of continuous in-situ sampling in coastal and estuarine waters. The purpose was to determine the feasibility of a particular sampler design for the collection of surface oil from a known surface area of water during a finite sampling interval. The determination of average surface oil per unit area was required as a means of establishing an ambient background level of oil pollution, monitoring changes in oil level with time, and relating these changes to pollution sources. The approach used a weir to provide a self-adjusting, wave-following means of skimming surface water at a fixed rate determined by a downstream, constant speed, battery driven screw pump. A sorbent material (polyurethane foam) collected the oil. At the completion of the collection time, the cartridge was analyzed for oil content. Collected surface area was determined separately by measurement of the average surface flow during the sampling interval. The results of tests with the buoy deployed in ocean conditions indicated a fundamental problem detrimental to its performance. The continuous bobbing of the buoy caused a pumping action around the buoy, counteracting the prevailing current flow and seriously reducing the amount of collected surface oil. (Sims-ISWS)
W75-05099

KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W75-05110

SEEPAGE-ENVIRONMENTAL ANALYSIS OF THE SLIME ZONE OF A TAILING POND,
Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
For primary bibliographic entry see Field 5B.
W75-05115

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM - VOLUME II - DESIGN REPORT.
Aerojet Electrosystems Co., Azusa, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-779 483, $10.50 in paper copy, $2.25 in microfiche. Report No. CG-D-46-74, June 1973. 393 p, 101 fig, 21 tab, 2 append. DOT-CG-22,170-A.

Descriptors: *Remote sensing, Equipment, *Oil spills, Design, Radar, Infrared radiation, Water pollution, *Monitoring, *Pollutant identification.
Identifiers: Microwave radiometry, Low light level television.

Volume II contains details of the overall system design of the prototype Airborne Oil Surveillance System (AOSS). The AOSS is a multisensor airborne surveillance system configured to assist the Coast Guard in enforcement of antipollution legislation and assessment/clean-up of accidental spills. The surveillance system consists of (1) an X-band sidelooking radar system for long-range ship detection and adverse weather oil spill mapping; (2) a 37 GHz passive microwave imaging system for adverse weather spill mapping and spill thickness approximation; (3) a multispectral low light level TV system for spill identification, high resolution documentation, and violator identification; (4) a multichannel infrared line scanner for spill identification and discrimination; (5) a position reference system for legal and operational effectiveness; and (6) a real-time processor/display console for maximum operational effectiveness. (See also W75-05120) (Sims-ISWS)
W75-05119

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM - VOLUME III - SUBSYSTEM SPECIFICATIONS.
Aerojet Electrosystems Co., Azusa, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-779 484, $6.25 in paper copy, $2.25 in microfiche. Report No. CG-D-47-74, June 1973. 157 p, 7 fig, 9 tab. DOT-CG-22,170-A.

Descriptors: *Remote sensing, *Equipment, *Oil spills, Design, Specifications, Infrared radiation, Water pollution, *Monitoring, *Pollutant identification.
Identifiers: Low light level television.

Details of the prototype Airborne Oil Surveillance System (AOSS) design were provided. The AOSS is a multisensor airborne surveillance system configured to assist the Coast Guard in enforcement of antipollution legislation and assessment/clean-up of accidental spills. Volume III contains detailed subsystem specifications. These subsystems include the infrared scanner, the low light level TV, the airborne data annotation system, and the inertial navigation system. Specifications for the radar system were not included due to its security classification. (See also W75-05119) (Sims-ISWS)
W75-05120

HYDROGEOLOGY OF THE LETHBRIDGE-FERNIE AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-05151

WATER QUALITY MONITORING AND AQUATIC ORGANISMS: THE IMPORTANCE OF SPECIES INDENTIFICATION,
Ball State Univ., Muncie, Ind. Dept. of Biology.
V. H. Resh, and J. D. Unzicker.
Journal Water Pollution Control Federation, Vol 47, No 1, p 9-19, January 1975. 1 tab, 70 ref.

Descriptors: *Pollutant identification, Bioindicators, *Aquatic life, *Bioassay, *Hydrobiology, *Ecological distribution, *Systematics, Aquatic habitats, Caddis flies, Environmental effects, Monitoring, Water quality, North America, Lake Erie.
Identifiers: Athripsodes, St. Lawrence River, Niagara River, Rock River.

Difficulties have arisen in the use of saprobic or indicator organism systems in developing water quality criteria and in biological assessments of water quality when organisms are not known at the species level. Tolerance categories of benthic macro-invertebrate genera were used to emphasize the need for species-level identification and to demonstrate the questionable value of the generic-level taxonomic unit as a water quality indicator. An example was given to indicate how water quality tolerances may be developed for the caddis fly genus Athripsodes. A need was stated for investigations to associate immature and adult stages, develop species identification keys, and correlate species occurrence with chemical and physical parameters, particularly in conjunction with preparation of environmental impact statements. The advantages of depositing collections, made by consulting firms, at museums or major universities were deliniated. (Harmeson-ISWS)
W75-05157

MONITORING MARINE OUTFALLS BY USING ULTRAVIOLET ABSORBANCE,
Victoria Univ. (British Columbia). Dept. of Biology.
N. Balch, D. Brown, R. Pym, E. Marles, and D. Ellis.
Journal Water Pollution Control Federation, Vol 47, No 1, p 195-202, January 1975. 5 fig, 3 tab, 8 ref.

Descriptors: *Diffusion, *Effluents, *Monitoring, *Oceans, *Organic compounds, Waste water disposal, Water quality, Canada, Sea water, Spectophotometry, Measurement, Statistical analysis, Outlets, Sewer outfalls, Pollutant identification.
Identifiers: Ultraviolet absorbance.

Investigations were conducted on the suitability of performing ultraviolet absorbance measurements on the receiving waters of two types of marine wastewater outfalls in an attempt to assess the

concentration of dissolved organic matter in seawater. A scanning spectrophotometer was used to obtain spectra of seawater-effluent mixtures in the laboratory and a wave length of 250 nanometers was selected for routine measurements of field samples with a standard laboratory spectrophotometer. Comparison with other water quality data that were collected over an 8-month period indicated that ultraviolet absorbance measurements could indicate, in the receiving waters, the presence of effluent from those types of marine outfalls where well defined effluent fields are to be found. However, where the effluent fields were extremely dilute, none of the routinely sampled parameters, including ultraviolet absorbance, were able to detect the presence of effluent. (Harmeson-ISWS)
W75-05159

THREE-STEP MEASUREMENT BY THE SAPROMAT TO EVALUATE THE BOD5, THE MINERAL IMBALANCE AND THE TOXICITY OF WATER SAMPLES,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
W. Verstraete, J. P. Voets, and R. Vanloocke.
Water Research, Vol 8, No 12, p 1077-1081, December 1974. 3 fig, 1 tab, 8 ref.

Descriptors: *Biochemical oxygen demand, *Waste water treatment, *Biological treatment, *Analytical techniques, *Organic matter, Water quality, Water properties, Eutrophication, Waste treatment, Wastes, Water chemistry, Estimating, Evaluation, Testing procedures, Organic compounds, Organic wastes, Biodegradation, Toxicity, *Pollutant identification.
Identifiers: *Sapromat technique, *Mineral imbalance, Microbial inoculum, Nutrient broth powder.

BOD sub 5 data obtained by analyzing wastewater samples, both by means of the dilution method and by means of the Sapromat technique, correlated satisfactorily (r = 0.98). However, the Sapromat technique turned out to be susceptible to certain distrubances such as variability of initial microbial inoculum, lack of essential mineral nutrients, and presence of toxic compounds. Therefore, a simple three-step Sapromat method was proposed. This method enables one to measure the BOD sub 5 and to calculate the biodegradation rate. In addition, it also allows one to evaluate the possible mineral imbalance, the toxicity, and/or the susceptibility to cooxidation of the wastewater sample. (Henley-ISWS)
W75-05162

GLC ANALYSIS OF 2,4-D CONCENTRATIONS IN AIR SAMPLES FROM CENTRAL SASKATCHEWAN IN 1972,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
S. S. Que Hee, R. G. Sutherland, and M. Vetter.
Environmental Science and Technology, Vol 9, No 1, p 62-66, January 1975. 4 fig, 3 tab, 7 ref.

Descriptors: *Pollutant identification, *Herbicides, *2,4-D, *Chromatography, *Air pollution, *Analytical techniques, Gas chromatography, Instrumentation, Air, Measurement, Chemical analysis, Evaluation, Chemistry, Testing procedures, Weed control, Mass spectrometry, *Canada, Solvents.
Identifiers: Saskatoon, Butyl ester, Octyl ester, Two-column technique, Boom spraying, Silica gel, Naicam, Rosetown.

Levels of 2,4-D (2,4-dichlorophenoxy, acetic acid) in the atmosphere of central Saskatchewan were estimated as butyl and octyl esters by using a two-column gas liquid chromatography technique, and then further characterized by chemical derivatization. Glc mass spectrometry confirmed the presence of 2,4-D. Mean total daily levels of 2,4-D (as n-butyl ester) found for Saskatoon for 33 days were 600 ng/cu m of air, and for Naicam for 47 days, 142 ng/cu m of air. Very little 2,4-D was detected at Rosetown. (Henley-ISWS)
W75-05176

COMPARISON OF INSTRUMENTAL METHODS TO MEASURE NITROGEN DIOXIDE,
Research Triangle Park, N.C. National Environmental Research Center, Chemistry and Physics Div.
R. E. Baumgardner, T. A. Clark, and R. K. Stevens.
Environmental Science and Technology, Vol 9, No 1, p 67-69, January 1975. 2 fig, 5 tab, 8 ref.

Descriptors: *Pollutant identification, *Measurement, *Nitrogen compounds, Evaluation, *Analytical techniques, *Instrumentation, Automation, Chemical analysis, Data collections, Monitoring, Gases, Nitrogen, Testing procedures, Laboratory tests, Chemistry, Colorimetry, Maintenance, Sampling.
Identifiers: Instrumental methods, *Coulometry analyzers, Chemiluminescent monitors, Calibration stability.

A comparison study was performed between the newly developed chemiluminescent NO-NO2 monitor and existing automated NO2 monitors based on coulometry and colorimetry and the 24-hr manual reference method for the measurement of NO2. Correlations were obtained among the various techniques by sampling ambient air in a nonurban atmosphere. In addition, a detailed study of maintenance requirements, calibration stability, and typical response patterns of the instrumental methods was obtained. The chemiluminescent monitors successfully measured ambient concentrations of NO2 under conditions of this study. The coulometric monitor gave lower mean values and the Federal Reference method gave higher mean values than the other measurement methods at this nonurban site. Performance tests showed that the chemiluminescent monitors have a faster response time than the coulometric or colorimetric methods and that each method has the sensitivity to measure NO2 concentrations of 0.01 ppm. Analysis of the calibration data for each instrumental method showed little variation. (Henley-ISWS)
W75-05184

MERCURY LEVELS IN LAKE POWELL: BIOAMPLIFICATION OF MERCURY IN MAN-MADE DESERT RESERVOIR,
New Mexico Univ., Albuquerque.
L. Potter, D. Kidd, and D. Standiford.
Environmental Science and Technology, Vol 9, No 1, p 41-46, January 1975. 3 fig, 1 tab, 28 ref.

Descriptors: *Pollutant identification, *Food chains, *Mercury, *Reservoirs, Algae, Bottom sediments, Fish, Invertebrates, Periphyton, Phytoplankton, Colorado River, Organic matter, *Arizona.
Identifiers: *Lake Powell(Ariz), Atomic absorption, Hydroelectric reservoir.

Flameless atomic absorption analyses of samples from Lake Powell, a new reservoir remote from major man-caused pollution sources, yielded mean mercury levels in parts per billion of 0.01 in water, 30 in bottom sediments, 10 in shoreline substrates, 34 in plant leaves, 145 in plant debris, 28 in algae, 10 in crayfish, and 232 in fish muscle. Trout were unique in having lower concentration in muscle than in highly vascularized blood tissues. Increased concentrations were found with increased body weight and higher levels on the food chain. Concentration in muscle of some large fish (largemouth bass and walleye pike) over 2 kilograms whole body weight exceeded 500 parts per billion. Results demonstrated bioamplification of mercury up the food chain and association of mercury with organic matter. (Harmeson-ISWS)
W75-05185

METHODS FOR MEASURING NO2 PHOTODISSOCIATION RATE, APPLICATION TO SMOG CHAMBER STUDIES,
Ford Motor Co., Dearborn, Mich. Scientific Research Staff.
C. H. Wu, and H. Niki.
Environmental Science and Technology, Vol 9, No 1, p 46-52, January 1975. 5 fig, 2 tab, 32 ref.

Descriptors: *Pollutant identification, *Smog, *Air pollution, *Nitrogen compounds, Air pollution effects, Evaluation, Measurement, Analytical techniques, Instrumentation, Gases, Chemistry, Testing procedures, Haze, Ozone, Radiation, Solar radiation, Atmosphere.
Identifiers: *Photodissociation rate, *Atmospheric chemistry, *Photolysis, Decay rate, Photochemical smog.

Methods for determination of the photodiasociation rate of NO2 were evaluated critically for application in smog studies. The kinetics and mechanism of NO2 photolysis at ppm levels in 760 torr N2 or air were studied in detail by using a 45-liter bell jar reactor. Concentration-time profiles of the reactant NO2 and the products NO and 03 were monitored continuously by the NO-03 chemiluminescence method. The decay of NO2 in N2 deviated from first-order behavior, this being most noticeable in the early stages of photolysis when the yield of NO is less than a few percent. Thus, the commonly used k sub d method, based on the assumption of first-order decay, is not applicable. Alternative kinetic expressions were derived and validated, and values of the relevant rate constant ratios were obtained. In the photolysis of NO2 in air, the attainment of a photostationary state for NO2, NO, and O3 was observed, and the photodissociation rate can be determined from this relationship. Data obtained under various conditions were analyzed in terms of an 11-step mechanism by using numerical integration techniques. A set of rate constants was derived which can adequately describe the photolysis of NO2 at ppm level either in N2 or in the air. (Henley-ISWS)
W75-05190

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPERS AND CYANIDE COMPLEXING,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
A. M. Kolaczkowski.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 930, $4.25 in paper copy, $2.25 in microfiche. Master of Science thesis, June 1972. 66 p, 7 tab, 8 fig, 43 ref, 5 append. OWRT A-026-PA(1). 14-31-0001-5038.

Descriptors: *Neutron activation analysis, *Analytical techniques, *Chemical analysis, *Acidic waters, *Heavy metals, Surface waters, *Ion exchange, *Pollutant identification.
Identifiers: Multielement analysis, *Cyanide complexing, Large water volume irradiation.

A technique is described for the multielement analysis of heavy metals in surface waters. It is capable of quantitative measurements of heavy metals down to trace amounts as shown by the 10 analyses performed. It is rapid enough to show great promise in future water monitoring programs. The technique has possibilities as a useful tool for heavy metal analysis of gasoline and other petroleum products, of blood, of human lung and other tissues, of foods, and other areas, provided the sample can be dissolved into an easily handled liquid form. The technique eliminates of sodium and bromine interference; sample preparation to the counting of the filter papers takes about 2-1/2 days (includes 2-day cooling period). The iodine-131 extraction step, the cyanide complexing step, and the filtering stage take only about 2-3 hours. The technique is very simple. (See also W75-05275) (Sink-Penn State)
W75-05274

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPERS AND CYANIDE COMPLEXING,
Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.
A. Kolaczkowski, and W. A. Jester.
Journal of Radioanalytical Chemistry, Vol 16, 1973. p 21-29, 2 tab, 4 fig, 7 ref. OWRT A-026-PA(2). 14-31-0001-5038.

Descriptors: *Neutron activation analysis, *Analytical techniques, *Chemical analysis, *Acidic waters, *Heavy metals, Surface waters, *Ion exchange, *Pollutant identification.
Identifiers: Multielement analysis, *Cyanide complexing, Large water volume irradiation.

A simple, reasonably rapid, and accurate technique is developed for the multielement analysis of heavy metals in surface waters using ion exchange filter papers and cyanide complexing in conjunction with neutron activation analysis. The method employs large water volume irradiation for improved sensitivity. Te was used as an internal flux monitor to correct for neutron flux variations in the samples. Proof of the value of this technique was obtained by the analysis of 10 surface water samples previously analyzed using conventional methods by the U.S. Geological Survey of the U.S. Department of Interior. Good agreement resulted from this comparison. (See also W75-05274) (Sink-Penn State)
W75-05275

PROCEEDINGS OF THE FIRST ANNUAL NSF TRACE CONTAMINANTS CONFERENCE.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W75-05277

ANALYTICAL STUDIES OF THE SPECIATION OF MERCURY, ARSENIC AND ANTIMONY,
University of South Florida, Tampa. Dept. of Chemistry.
R. S. Braman, D. L. Johnson, and C. C. Foreback.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, March, 1974. p 359-378, 5 fig, 4 tab, 7 ref.

Descriptors: *Analytical techniques, *Mercury, *Arsenic compounds, Testing procedures, Laboratory tests, Organic compounds, Inorganic compounds, Water, Pollution, Toxicity, Aqueous solutions, *Pollutant identification.
Identifiers: *Antimony.

A d.c. discharge detector system used with a He carrier gas had a limit of detection near 0.01 nanograms for mercury, thus permitting the analysis of 3 to 100 ng. Hg/cu M in 30 to 100 liter air samples. Selective determination and determination of metallic mercury, dimethyl mercury, methylmercury (II) compounds and less volatile mercury compounds such as HgC12 were achieved using a five-section sampling tube system. Water samples were analyzed for inorganic mercury ions and for methylmercury (II) compounds by selective reduction and detection in a d.c. discharge emission type system. Limits of detection were near 0.01 ppb. Methylmercury (II) compounds were found in a number of water samples. Analytical procedures were developed which permit the determination of arsenite ions, arsenate ions, dimethyl arsenic acid, methylarsonic acid, and, if present, phenylarsonic acid in aqueous solutions. Based upon reduction to arsine and detection in a direct current discharge emission detection system, the methods were capable of fractional nanogram limits of detection. Antimony analyses were done in a similar manner. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05278

GAS CHROMATOGRAPHY/MICROWAVE EMISSION SPECTROSCOPY FOR MEASURING VOLATILE ORGANOMETALLICS,
Oak Ridge National Lab., Tenn.
Y. Talmi, and R. E. Mesmer.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission Office of Information Services, Technical Information Center, Oak Ridge, Tenn, March, 1974. p 381-396, 6 tab, 4 fig, 18 ref.

Descriptors: *Analytical techniques, *Chromatography, *Mercury, Atmosphere, Natural streams, Organic compounds, Chemical reactions, Effluents, Industrial wastes, *Pollutant identification.
Identifiers: *Organometallics.

Gas chromatography with the very sensitive microwave emission spectrometric detector has been used to study the distribution of (CH3)2Hg between air and water and the vapor pressures above CH3HgX compounds and their solutions. The distribution coefficient for (CH3)2Hg is 0.31 at 25C and 0.15 at 0C which shows that this compound will be readily lost to the atmosphere above natural waters. The vapor pressures of CH3HgCl (s) and CH3HgOH(s) are 11 and 5.6 microns of Hg respectively at 22C. The volatility of monomethyl mercury above water solutions as a function of pH can be interpreted in terms of the known equilibria occurring in the water phase. Very rapid photochemically catalyzed reactions of CH3HgX with I2 or Br2 at very low concentrations were discovered in water at room temperature. Such reactions offer a potential means for the destruction of CH3HgX from laboratory or industrial discharges. In addition the reaction with I2 is an important potential source of error in analytical procedures utilizing the high extractability of the CH3HgI species. The reaction produces CH3I and HgI2(s) and is first-order in the concentrations of both the CH3HgCl and I2. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05279

DETERMINATION OF TRACE ORGANIC CONTAMINANTS IN NATURAL WATERS BY HIGH-RESOLUTION LIQUID CHROMATOGRAPHY,
Oak Ridge National Lab., Tenn.
R. L. Jolley, C. D. Scott, W. W. Pitt, Jr., and M. D. McBride.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Ctr., Oak Ridge, Tenn, March, 1974. p 397-412, 4 fig, 6 tab, 16 ref.

Descriptors: *Trace elements, *Contaminants, *Organic compounds, *Natural streams, *Chromatography, Analytical techniques, Instrumentation, Pollutants, Anion exchange, Absorption, Tracers, Chlorination, *Pollutant identification.

High-resolution liquid chromatography is one instrumental technique which has been demonstrated to be capable of determining individual molecular contaminants. Samples of polluted natural waters have been collected at different sites, concentrated up to 10,000-fold, and chromatographed on a high-pressure anion-exchange column. By monitoring column eluate for ultraviolet absorbance and cerate oxidizability, the presence of numerous organic contaminants at concentrations less than 1 microgram/liter has been revealed. A multiple-analytical procedure for identification of constituents separated by high-resolution liquid chromatography has been effectively applied to the analysis of polluted waters, such as process effluents. Data obtained by the coupling of radioactive tracer techniques with high-resolution chromatography have shown that the chlorination of polluted water results in chlorinated organics. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05280

SPECIAL ANALYTICAL PROBLEMS IN THE ANALYSIS OF MOLYBDENUM BY ATOMIC ABSORPTION SPECTROPHOTOMETRY AND COLORIMETRIC METHODS,
Colorado Univ., Boulder. Molybdenum Project.
R. R. Meglen, and M. L. Glaze.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974. p 415-419, 2 fig.

Descriptors: *Analytical techniques, *Molybdenum, *Trace elements, *Spectroscopy, *Colorimetry, Testing procedure, Laboratory tests, Rocks, Soils, Sediments, Waters, Sewage, Aluminum, *Pollutant identification.

Rocks, soils, sediments, waters, sewage and biological samples were analyzed for molybdenum content. An interlaboratory exchange of some plant samples revealed matrix interference effects in the atomic absorption analysis for molybdenum. The interferences were removed by the addition of 1000 ppm of Al to the analyte. The importance of checking for matrix interference in atomic absorption analyses for molybdenum was emphasized. A.A. analyses were also performed on aliquots of the dilute 2% Mg(NO3)2 samples to which 1000 ppm ammonium ion was added. These analyses were accurate only at concentration below 30 ppm. The effect of background correction with a hydrogen continuum lamp was also examined. Background correction was not necessary for these samples. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05281

QUANTITATIVE TRACE ELEMENTS ANALYSIS WITH X-RAY FLUORESCENCE,
Oak Ridge National Lab., Tenn.
C. J. Sparks, Jr., and J. C. Ogle.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tennessee, Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974. p 421-439, 5 fig, 3 tab, 8 ref.

Descriptors: *Analytical techniques, *Trace elements, *X-ray fluorescence, X-rays, Spectroscopy, Radioisotopes, Heavy metals, *Pollutant identification.

Methods for using x-ray fluorescence for quantitative determination of trace elements in samples of environmental interest were given. Monoenergetic exciting x-rays obtained by using a doubly bent hot pressed pyrolytic graphite monochromator with a standard x-ray tube and solid state detector system allowed the determination of trace elements to levels of a few parts per million. Geometrical considerations in the design of the x-ray detection collimator system were discussed and the measurements of the necessary parameters for converting the observed fluorescent intensities into quantitative units were described. If a wide variety of samples of differing densities are to be analyzed, it is important that the sensitive area of the detector subtend the same solid angle for the fluorescent radiation from each part of the irradiated volume of the sample. The experimental intensity data along with published values of fluorescent yields, x-ray cross sections and scattering factors are all that are needed to do quantitative determination. No standard samples are needed. The measurement of the absorption coefficients for both the exciting and fluorescent x-rays in the sample and the background determination pose the major limitations to the accuracy of the analyses. Techniques were given to minimize the errors which could arise from these sources. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05282

HUMAN HAIR AS AN INDICATOR OF TRACE METAL ENVIRONMENTAL EXPOSURE,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
A. A. Gordus, C. C. Maher, III, and G. C. Bird.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974. p 463-487, 15 fig, 4 tab, 15 ref. NSF(GI-31556).

Descriptors: *Trace elements, *Human physiology, *Analytical techniques, Spectroscopy, Pollutants, Testing procedures, Laboratory tests, Cadmium, Mercury, Lead, Zinc, Distribution, Statistical analysis, *Pollutant identification.

Both present-day and historical head-hair samples up to 200 years old were analysed for 38 trace elements using neutron activation and flameless atomic absorption spectrophotometry. This study was designed to permit evaluating the relationship between the trace-metal content of hair and (a) a wide variety of factors such as age, sex, diet, hair color, shampoos, extent of hair washing, etc., (b) the trace-metal content of blood and (c) the level of human intake of trace metals from pre-industrial periods to the present. Over 800 well-documented historical hair samples were obtained from museums and private owners and consisted primarily of hair encased in lockets or brooches as well as imitation-floral wreaths made of hair. The modern samples included hair obtained from Naval Academy midshipmen and Air Force Academy cadets both upon their arrival at the academies in mid-1971 and again six, eleven and 22 months later after equiiibration to fixed diets and environments. Examples of some of the initial historical and modern hair analysis data were presented. In some cases it appears that human intake of certain trace metals has decreased in the last 100 years. Preliminary statistical correlations show a positive relationship between grades and Ti and Cu and a negative relationship between grade and I and Cd. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05283

UTILITY OF PLACENTAL TISSUE AS AN INDICATOR OF ENVIRONMENTAL EXPOSURE,
Vanderbilt Univ., Nashville, Tenn.
R. J. Baglan, A. B. Brill, D. Wilson, W. Schaffner, and A. Schulert.
In: Proceedings of the First Annual NSF Trace Contaminants, August 8-10, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974. p 504-509, 2 tab, 1 ref. NSF(GI-35348).

Descriptors: *Trace elements, *Human physiology, *Laboratory tests, Laboratory animals, Rodents, Toxicity, Testing procedures, Mercury, Lead, Cadmium, Zinc, Iron, Cobalt, Correlation analysis, Analytical techniques, Spectroscopy, Tracers, Organic compounds, Inorganic compounds, *Pollutant identification, *Bioindicators.

The placenta was investigated as a possible indicator of environmental exposure. Levels of eight trace elements (Hg, Pb, Cd, Se, Rb, Zn, Fe, Co) were measured in human placenta, maternal blood, and fetal blood. The trace element levels for the various tissues were correlated against one another. The elemental levels were also examined with respect to birth month, race, socio-economic status, gestational age at delivery, and infant status at birth. For several elements the levels in the placenta correlated against the levels in the maternal and fetal blood. In animal tracer studies - the mercury levels in placenta, infant hair, and total infant correlated among one another. The determination of the elemental levels in placenta reflected the elemental concentrations in the mother and infant. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05284

STABLE ISOTOPE STUDIES OF HUMAN LEAD METABOLISM,
California Univ., Los Angeles.
G. W. Wetherill, and J. D. Kopple.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974. p 510-518, 5 fig, 1 tab, 8 ref. NSF(GI-38339).

Descriptors: *Distribution, *Lead, *Human physiology, *Stable isotopes, *Diets, Isotope studies, Tracers, Radioisotopes, Absorption, Laboratory tests, Analytical techniques, Spectroscopy, Metabolism, *Pollutant identification, *Bioindicators.

A healthy man was fed a nutritious diet low in Pb content (156 micrograms (day) for 144 days in a metabolic unit. During the first 104 days, he also received 204 micrograms of Pb-204, a rare non-radioactive isotope, as Pb (NO3)2 to achieve a normal Pb intake. Concentration and isotopic composition of Pb was determined by mass spectrometry in all feces and urine and serially in diet, blood, and other body tissues and fluids. Results indicated that about 10% of dietary lead was absorbed and 8 micrograms/day was excreted endogenously into feces. Kinetic analyses identified 2Pb pools. Pool 1, distributed primarily in blood, contained about 1800 micrograms of Pb and had a half-life of 19 days. Pool 2 was as long lived and about half as large. Urine and blood were in isotopic equilibrium while the Pb in bile, gastric fluid and hair appeared to come from pool 2. When dietary Pb-204 was discontinued, blood, urine, and fecal Pb decreased, and the data suggested a close relation between blood, urine, and dietary Pb at this exposure range. No homeostatic mechanism for a preferred blood level was seen. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05285

A NETWORK TO DETERMINE CAUSALITY BETWEEN ABNORMAL TRACE ELEMENT LEVELS IN COGENITAL DEFECTS,
Vanderbilt Univ., Nashville, Tenn.
A. B. Brill, R. J. Baglan, W. Fleet, W. Schaffner, and A. Schulert.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 521-527, 4 tab. NSF (GI-35348).

Descriptors: *Trace elements, *Human pathology, *Laboratory tests, *Statistical analysis, Testing procedures, Sampling, Reproduction, Human physiology, Pollutant identification, *Bioindicators.

Placenta, blood and hair samples from a large number of births in Nashville were collected during 1971-73. These were analyzed for trace element content and findings were related to pregnancy outcome. Abnormalities such as numbers of abortuses, stillbirths, and neonatal deaths, and postnatal illnesses were studied. No unusual deviations from expectancy were noted. However, the study design should be useful if extended to communities with elevated elemental levels, and attention should be focused on a selected few types of malformations and matched normals. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05286

BIOLOGY OF MOLYBDENUM: PLATELET BIOCHEMISTRY AND FUNCTION - POSSIBLE USE IN EVALUATING TRACE METAL EFFECTS,
Colorado Univ., Denver. Dept. of Medicine and Pediatrics.
C. C. Solomons, and E. M. Handrich.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 528-533. 1 fig, 5 ref.

Descriptors: *Molybdenum, *Trace elements, *Human physiology, Biochemistry, Biology, Analytical techniques, Chromatography, Laboratory tests, *Pollutant identification, *Bioindicator.

A sensitive method was described in detail for obtaining nucleotide profiles in blood platelets using 1-2 ml of platelet-rich-plasma. The results provided information which can be used to study a wide variety of environmental stresses on human or animal cells. From the control studies it was seen that care must be exercised in handling the platelets especially with regard to washing with buffer and the temperature during storage of the charcoal pellets. The authors concluded that it should be possible to adapt the method to measure nucleotide changes affecting the survival of platelets exposed in vitro and in vivo to foreign internal surfaces such as prosthetic heart valves and other implantable devices. The effects of molybdenum salts on platelet metabolism was also evaluated. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05287

BEHAVIORAL EFFECTS OF METHYLMERCURY,
Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.
H. L. Evans, V. G. Laties, and B. Weiss.
In: Proceedings of the First Annual NSF Trace Contaminants Conference, August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 534-540, 2 fig, 9 ref.

Descriptors: *Mercury, *Behavior, *Organic compounds, *Toxicity, Laboratory tests, Human physiology, Animal physiology, Laboratory animals, Birds, Mammals, *Pollutant identification, *Human pathology.
Identifiers: *Methylmercury.

Experiments were aimed at identifying behavioral tests capable of revealing methylmercury-induced damage. A further aim was to determine brain mercury concentrations that accompany behavioral symptoms and to clarify the contribution of exposure duration, an important parameter influencing the spectrum of observed symptoms. Visual impairment has provem to be a primary symptom in monkeys after sub-acute and chronic exposure to methylmercury. These monkeys had blood Hg concentrations of from 1.0 to 3.5 microgram/ml. The highest concentrations of Hg in brain were found in occipital cortex, which subserves visual function. Impairment of the stability to discriminate visual stimuli on the basis of form, and a reduction in ability to detect a dim light were the consequences observed. Motor incoordination was minimal and appeared much later than the emergence of the visual symptoms. In contrast to the monkey, a higher body burden of methylmercury was required to produce behavioral symptoms in the pigeon. Unlike the monkey, the pigeon displayed clear motor deficits, reflected by a disruption of orderly patterns of conditioned behavior and by a loss of the ability to fly. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05288

THE EFFECT OF MERCURIALS ON DNA-MEDIATED TRANSFORMATION IN BACILLUS SUBTILIS,
Rochester Univ., N.Y. Dept. of Microbiology.
D. J. Groves, and F. E. Young.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-

mission, Office of Information Service, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 543-553, 6 fig, 2 tab, 12 ref. NSF (GI-300978

Descriptors: *Mercury, *Bacteria, *Cytological studies, Ions, Laboratory tests, Biochemistry, *Pollutant identification, Human pathology, *Inhibition, Bioindicators.
Identifiers: *DNA.

Mercuriation of DNA inhibited transformation of Bacillus subtilis without decreasing the viability of the population. Pretreatment of the cells with Hg(++) also selectively blocked the transformation reaction. This inhibition of genetic transformation was accompanied by a decrease in the irreversible binding of DNA, suggesting that Hg(++) ions interfere with an early step in the transformation reaction by preventing the specific binding of DNA to the surface of the cell. The data indicated that Hg(++) may be used as a probe to dissect steps in the transformation reaction. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05289

THE UPTAKE AND SOME PHYSIOLOGICAL EFFECTS OF CADMIUM ON CORN,
Illinois Univ., Urbana. Dept. of Agromony.
For primary bibliographic entry see Field 5C.
W75-05290

PRELIMINARY DETERMINATIONS OF TRACE METALS IN HI-VOL PADS AND SOILS AROUND THE SOUTH END OF LAKE MICHIGAN,
Metropolitan Sanitary District of Greater Chicago, Ill. Research and Development Dept.
R. I. Peitz, J. E. Newman, and W. A. Bruns.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 573-588, 4 fig, 4 tab.

Descriptors: *Trace elements, Soils, Lakes, *Data collections, Cadmium, Lead, Copper, Zinc, On-site data collections, Sampling, Particle size, *Heavy metals, *Indiana, *Illinois, Filters, Analytical techniques, Correlation analysis, *Lake Michigan, *Pollutant identification, *Path of pollutants, *Soil analysis.

Cadmium, lead, copper and zinc were analyzed from total suspended particulate sample pads for 63 locations in NW Indiana and Cook County, Illinois. The study covered a three-month period for each regularly scheduled EPA sampling day from December,1972 through February, 1973. For each location, comparisons were made between mean daily total particulate and each of the four trace metals studied. Variability in sample pad loading was compared with the individual variability of the four trace metals. Soil sampling transects were initially established in northwest Indiana during 1972 to determine if airborne trace metal particulates from the Gary-East Chicago, Indiana area were contaminating the soils of the region. Sampling sites along the transects were selected using a constant geometric ratio. The soils collected at depths of 0-2.5 centimeters revealed higher levels than those taken at greater depths. Trace metal concentrations were highest in urban areas and generally decreased with distance from the urban sampling sites. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05291

DISTRUBUTION OF HEAVY METALS IN A BORROW PIT,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5B.
W75-05292

INVESTIGATION OF ENRICHMENT OF MOLYBDENUM IN THE ENVIRONMENT THROUGH COMPARATIVE STUDY OF STREAM DRAINAGES, CENTRAL COLORADO,
Colorado Univ., Boulder. Dept. of Geological Science.
For primary bibliographic entry see Field 5B.
W75-05293

ARSENIC DISTRIBUTION IN WATERS AND SEDIMENTS OF THE PUGET SOUND REGION,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-05294

DYNAMIC REDISTRIBUTION OF METHYLMERCURY IN A POND ECOSYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W75-05295

PATTERNS OF TRACE-ELEMENT DISTRIBUTION IN A FORESTED WATERSHED,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W75-05296

ACCUMULATION OF AVAILABLE MOLYBDENUM IN AGRICULTURAL SOILS IRRIGATED WITH HIGH-MOLYBDENUM WATERS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-05297

PROBLEMS AND OPPORTUNITIES IN INTERDISCIPLINARY RESEARCH: THE MOLYBDENUM PROJECT,
Colorado Univ., Boulder. Dept. of Physics and Astrophysics.
For primary bibliographic entry see Field 5G.
W75-05298

NATIONAL NEED - AN INDUSTRY VIEW OF RESEARCH,
AMAX Lead and Zinc, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 5G.
W75-05299

AN APPROACH TO THE CONTROL OF TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W75-05300

INFORMATION SYSTEMS IN ENVIRONMENTAL RESEARCH AND DECISION-MAKING,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 6B.
W75-05301

QUICK-TIME INSTRUMENTAL MEASUREMENTS OF WASTE-WATER ORGANIC CHARACTERISTICS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
T. Helfgott, and F. L. Hart.
In: Progress in Water Technology, Vol 6, p 159-168, 1974. 1 fig, 2 tab, 10 ref. (Edited by J. F. Andrews, and S. H. Jenkins, and R. Briggs). OWRT A-030-CONN (5) 14-01-0001-3007.

Descriptors: *Waste water treatment, *Organic wastes, *Automatic control, Sewage effluents, Sewage treatment, Ammonia, Nitrates, Nitrogen, Statistical models, *Pollutant identification, *Measurement, Instrumentation, *Biochemical oxygen demand.
Identifiers: *Quick-time instrumental measurements, Real time responses, Carbonaceous oxygen demand, Total oxygen demand, Total organic carbon, Total nitrogen, Statistical correlation analysis.

A rationale for replacing the biochemical oxygen demand either 5-day, ultimate or ultimate carbonaceous by quick-time (Real-time) measures of organic pollution is presented. Quick-time measures of organic pollution include total oxygen demand (TOD), total organic carbon (TOC), total nitrogen (TN) and ion selective probes for measuring ammonia and nitrates. Four statistical models are presented to illustrate the interrelations that can be made with quick-time measurements noting problems of interpretation. Correlation coefficients for the various regression analyses are presented for the four statistical models. These values pertain only to a specific municipal waste water. Pitfalls in using correlations include misinterpretation (e.g., BOD cannot measure persistence) and statistical artifiact (e.g., using unrelated microbial populations for BOD data). These models are established only for the purpose of automating plant operations and are not intended to replace existing laboratory procedures which have value in characterizing wastes. It is suggested, however, that the quick (real-time) measure of pollution replace BOD in the operation of wastewater treatment plants. (de Lara-Connecticut)
W75-05304

CONTROL OF ENVIRONMENTAL IMPACTS FROM ADVANCED ENERGY SOURCES,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W75-05313

TOTAL MERCURY MONITOR,
Ionics, Inc., Watertown, Mass. (assignee)
I. A. Capuano.
United States Patent 3,826,614. Issued July 30, 1974. Official Gazette of the United States Patent Office, Vol 924, No 5, p 1282, July 30, 1974. 1 fig.

Descriptors: *Patents, *Mercury, *Analytical techniques, Equipment, *Monitoring, *Pollutant identification, Liquid wastes.
Identifiers: Total mercury monitor.

An apparatus and method are described for analyzing liquid streams for their mercury content including elemental mercury, ionic mercury and undissociated mercury compounds. The sample is automatically measured and treated with an acidic metal salt reagent containing an oxidant for oxidizing elementary mercury in the sample to ionic mercury. It is then treated with hydrazine to form a catalytic colloid. Elementary mercury is formed by the action of hydrazine and the catalytic colloid on the ionic and combined mercury. The results are indicated and/or recorded by transferring the elemental mercury to a photometric detector. (Orr-FIRL)
W75-05333

USE OF MACRORETICULAR RESINS IN THE ANALYSIS OF WATER FOR TRACE ORGANIC CONTAMINANTS,
Ames Lab., Iowa.
G. A. Junk, J. J. Richard, M. D. Grieser, D. Witiak, and J. L. Witiak.
Journal of Chromatography, Vol 99, p 745-762, November 6, 1974. 3 fig, 7 tab, 25 ref. OWRT A-046-IA(2).

Descriptors: *Water analysis, *Organic compounds, *Pollutant identification, Analytical techniques, Separation techniques, Adsorption, Gas chromatography, Alcohols, Acids, Aromatic compounds, Ethers, Chlorinated hydrocarbon

pesticides, Herbicides, Trace elements, Resins, Water chemistry, Water properties, Phenols.
Identifiers: Aldehydes, Alkylbenzenes, Esters, Ketones.

Organic impurities in water can be isolated by sorption on a small column of a macroreticular resin. Organic compounds are readily eluted by diethyl ether; the eluate is then concentrated by evaporation, and the organics are separated and determined by gas chromatography. Studies on a large number of model compounds (e.g., alcohols, alkyl benzenes, phenols, pesticides and herbicides, aldehydes, acids, aromatic halides, chlorinated phenols, esters, ethers, ketones, and various compounds containing halogens, N, or S) added to water in the 10 to 100 ppb range (20 parts per trillion for pesticides) demonstrated that this method is accurate and reliable. An extensive study of the procedure revealed several critical steps where proper technique and conditions are essential to avoid serious error. These include resin purification and handling, preparation of standard samples containing organic impurities, and the technique and apparatus used in concentrating the Amberlite XAD column eluate. (Witt-IPC)
W75-05340

THE DIFFERENTIATION OF SUBMICROGRAM AMOUNTS OF INORGANIC AND ORGANOMERCURY IN WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
North Dakota Univ., Grand Forks.
R. J. Baltisberger, and C. L. Knudson.
Analytica Chimica Acta, Vol 73, No 2, p 265-272, December, 1974. 4 fig, 1 tab, 21 ref. OWRT B-020-NDAK(1).

Descriptors: *Mercury, *Water analysis, Surface waters, Analytical techniques, Chemical analysis, Metals, Water pollution sources, Water pollution, Trace elements, *Pollutant identificatin, Inorganic compounds, Organic compounds, Heavy metals.
Identifiers: *Atomic absorption spectrometry.

A method for the determination of the individual concentrations of Hg(II) and organomercury, RHg(II), in aqueous solutions is described. The mercury metal produced by reduction with Sn(II) is measured by the flameless atomic absorption method. The selective reduction of Hg(II) is achieved in the presence of RHg(II) in sulfuric acid media with Sn(II). The total Hg content is then measured after oxidation with acidic hydrogen peroxide solution just before injection into the Sn(II) solution of the mercury analyzer. The method is useful in the range 1-5 ppb, with a standard deviation of 1 oppb at 15 ppb, and is satisfactory for the analysis of Hg in river water. (Witt-IPC)
W75-05341

BENTHIC ANIMAL-SEDIMENT,
Maryland Univ., Prince Frederick. Natural Resources Inst.
M. K. Mountford, D. K. Phillips, and J. A. Mihuraky.
In: Report No ORO-4328, Vol 2, p 192-344, August 1973. 90 fig, 18 tab, 65 ref.

Descriptors: *Monitoring, *Nuclear powerplants, *Radioactivity, Aquatic environment, *Environmental effects, *Chesapeake Bay, Benthic fauna, *Estuarine environment, Aquatic animals, *Sediments, Hydrography, Surveys, Sampling, Temperature, Salinity, Sites, Speciation, Data collections, Biomass, Particle size, *Maryland.
Identifiers: *Calvert Cliffs site(Md).

Cooperative programs are obtaining radionuclide and heavy metal data relative to the benthic animal-sediment study. The extensive data collected is reduced to a compact format which includes information on the following subject areas: I Hydrographic data: temperature and salinity; II Benthic infauna data, A. species data in raw tabular form, B. Species checklist, C. Range of number of individuals/species/sq. m., D. dominant species by month and phyla, E. numeric 3-D, log plots on total number of individuals/stations/sq. m./cruise, F. species-diversity treatments, G. biomass data, and; III Sediment-grain size characteristics/station and sampling zones. (See also W75-05342) (Houser-ORNL)
W75-05343

BLUE CRAB SURVEY IN THE WATERS ADJACENT TO THE CALVERT CLIFFS NUCLEAR STEAM ELECTRIC STATION AND THE CHESAPEAKE BAY REGION,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05344

FISH SURVEY: OTHER TRAWL COLLECTIONS OFFSHORE OF THE CALVERT CLIFFS NUCLEAR POWERPLANT SITE,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05345

PUERTO RICO NUCLEAR CENTER, ANNUAL REPORT, 1973.
Puerto Rico Univ., San Juan.
Available from NTIS, Springfield, Va, 22161 as Rept No PRNC-176, $7.60 in paper copy and $2.25 in microfiche. Report PRNC-176, p 208, 1973.

Descriptors: *Nuclear Energy, *Training, *Universities, *Instruction, *Puerto Rico, Ecology, Marine biology, Radioactivity, Public health, Nuclear Engineering, Agriculture, Electric power.

From the beginning in October 1957, the Puerto Rico Nuclear Center has been operated by the University of Puerto Rico under contract with the Atomic Energy Commission. Its initial function was to provide training in nuclear technology that would contribute to the technological development of Latin America. From a Basic Course in Radioisotope Techniques the breadth of the training program has continued to increase to include active participation in the graduate programs of the University of Puerto Rico leading to the Ph.D. and M.S. degrees in fields such as Chemistry, Biology, Physics, Radiological Health, Nuclear Engineering, Agriculture, and others; participation in a Medical Residency Program in Radiation Oncology; offering a new 5 month Course in Nuclear Medicine; providing Nuclear Reactor Supervisor and Operator Training Courses; offering Summer Workshops on Electrical Power Generation for secondary teachers; providing thesis research opportunities for students from universities located in continental United States and other countries; and many other specialized training activities. (Houser-ORNL)
W75-05350

5B. Sources Of Pollution

TRAINING MANUAL ON THE BASIC TECHNOLOGY OF THE PULP AND PAPER INDUSTRY AND ITS WASTE REDUCTION PRACTICES,
Lakehead Univ., Thunder Bay (Ontario).
For primary bibliographic entry see Field 5D.
W75-04871

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO 1: STATISTICS ON THE USE OF PEST CONTROL PRODUCTS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W75-04880

RECONNAISSANCE RESISTIVITY SURVEY AROUND A BRINE POND, ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4B.
W75-04883

INFILTRATION OF WATER INTO THE SOIL PROFILE,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W75-04918

INFILTRATION ROLE OF LARGE SOIL PORES: A CHANNEL SYSTEM CONCEPT,
Nevada Agricultural Experiment Station, Reno.
For primary bibliographic entry see Field 2G.
W75-04919

MECHANICS OF SURFACE RUNOFF ON HILLSLOPES,
Agricultural Research Service, Athens, Ga. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2E.
W75-04921

TRANSPORT PROCESSES OF PARTICLES IN DILUTE SUSPENSIONS IN TURBULENT WATER FLOW--PHASE III,
Illinois Univ., Urbana. Dept. of Nuclear Engineering.
B. G. Jones, N. M. Howard, C. Meek, and J. Thompkins.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 790, $5.25 in paper copy, $2.25 in Microfiche. Illinois Water Resources Center, Urbana, Research Report No 91, December 1974, 100 p, 4 tab, 45 fig, 33 ref. OWRT-B-067-ILL(2), 14-31-0001-3582.

Descriptors: *Dispersion, *Water pollution sources, *Sedimentation, *Turbulent flow, Air pollution, Instrumentation, Turbulence, *Path of pollutants, *Particle size, Model studies.
Identifiers: *Turbulent transport, *Particulate transport.

Understanding the basic mechanisms and predicting the behavior of particles suspended in turbulent fluid flow are essential to environmental conservation and to multiphase system design. Air and water pollution, sedimentation and erosion of river beds and coastal shorelines, and atmospheric fallout are some of the areas in which particle suspensions are of key importance. Detailed experimental measurements of dilute particle suspensions have been performed which examined the effects of particle size, shape and relative density on the statistical response of such particles in a turbulent fluid. Shape was of minor importance for spheres, cubes and tetrahedrons. However, size was important when the particle dimension was as large or larger than the fluid turbulence structure. Relative density influenced both free fall and inertial effects. An analytical model was developed which included these latter effects. It agrees well with observed particle dispersion measurements.
W75-04933

CLUSTER ANALYSIS AND DIVERSITY IN RECOVERY OF DAMAGED STREAMS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5C.
W75-04934

NITROGEN, PHOSPHORUS AND EUTROPHICATION IN THE FINGER LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5C.
W75-04936

THE GEOCHEMISTRY OF CERTAIN MINE AND SPRING WATERS, WESTERN SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
J. P. Gries, and P. H. Rahn.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 829, $3.75 as paper copy, $2.25 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, December 1974. 38 p, 8 fig, 1 tab, 10 ref, 2 append. OWRT A-040-SDAK(1), 14-31-001-4042.

Descriptors: *Mining, Dissolved solids, *Mine water, Mine wastes, *Geochemistry, *Groundwater, Hydrogeology, Streamflow, *Mine drainage, *South Dakota, Limestones, Iron, Discharge(Water), Water temperature, Conductance, Hydrogen ion concentration.
Identifiers: *Black Hill(S. Dak), Madison Limestone.

Fourteen inactive or abandoned gold-silver, lead-silver, or lead-zinc mines were located in the Northern Black Hills which discharge water from their portals or shaft collars. Some discharge fairly evenly throughout the year; some show high seasonal variation; and some drain only during the spring and early summer months. From three to eight visits were made to each property between September 1, 1973 and September 1, 1974, depending upon the volume of discharge and accessibility during winter months. Determinates made include volume of discharge, water temperature, hydrogen ion concentration (pH), specific conductance, and total iron. Where significant discharge entered directly into a stream, measurements were made of the stream water above and below the point of entry of the mine drainage. A total of 23 measuring points was monitored. The only mine workings to show discharges with low pH and high total iron were those with generally very small flow (less than 5 gpm) from workings developed in highly pyritized porphyry or schist. Large discharges, regardless of rock type, were potable as far as pH, iron and total dissolved solids were concerned. Total discharge for the 14 properties varied seasonally between 300 and 400 gpm. Effects of these discharges upon streams large enough to support aquatic life were negligible. (Wiersma-South Dakota State)
W75-04938

WATER QUALITY OF THREE SMALL WATERSHEDS IN NORTHERN UTAH,
Forest Service (USDA), Logan, Utah. Forest Sciences Lab.
R. D. Doty, and E. Hookano, Jr.
U.S.D.A. Forest Service Research Note, INT-186, October 1974. 6 p 1 fig, 1 tab, 8 ref.

Descriptors: *Watersheds(Basins), *Natural streams, *Water quality, *Utah, Chemical properties, Physical properties, Bacteria, Water pollution sources, Forest watersheds, Rocky Mountain region, Alpine, Potable water, Chlorination, Irrigation, *Small watersheds, *Demonstration watersheds.

The chemical, physical, and bacteriological characteristics of streamflow from three small adjacent drainages in the Wasatch Mountains of northern Utah are tabulated and discussed. These watersheds are sufficiently undisturbed so that their chemical water quality essentially reflects their natural characteristics. The water quality from these watersheds is extremely good and excellent for irrigation. However, the presence of fecal bacteria during much of the year would make it necessary to treat this water to make it potable. Minimal chlorination probably would suffice. Suspended sediment is negligible. (Witt-IPC)
W75-04943

CARBON AND COLOR DISTRIBUTION IN VARIOUS SIZE FRACTIONS OF TREATED PULP MILL AND BOARD MILL WASTE EFFLUENTS,
Saskatchewan Univ., Dept. of Civil Engineering. Saskatoon.
C. P. Hwang.
Tappi, Vol 57, No 12, p 148-149, Dec 1974. 3 tab.

Descriptors: *Pulp wastes, *Particle size, *Carbon, *Color, Dispersions, Aeration, Activated sludge, Sewage treatment, Industrial wastes, Suspended solids, Colloids, Dissolved solids, Waste water treatment.
Identifiers: Board mills, Kraft mills.

The particle size distributions of carbon and color were determined for a bleached kraft pulp mill effluent after aerated lagoon treatment and for a board mill effluent after activated sludge treatment. Three tables show the distribution of total carbon, organic carbon, and color in the effluents between suspended, colloidal, and dissolved solids. The distribution of effluent constituents is important in estimating dispersion, transport, and decomposition problems after discharge, and also in estimating what additional removal may be possible by coagulation, sedimentation, filtration, adsorption, or biological treatment, individually or in any combination. (Sykes-IPC)
W75-04948

NITRATE AND CHLORIDE MOVEMENT IN THE PLAINFIELD LOAMY SAND UNDER INTENSIVE IRRIGATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
F. J. Endelman, D. R. Keeney, J. T. Gilmour, and P. G. Saffigna.
Journal of Environmental Quality, Vol 3, No 3, p 295-298, July-September, 1974. 5 fig, 2 tab, 11 ref.

Descriptors: *Groundwater movement, *Nitrates, *Chlorides, *Leaching, *Fertilizers, Water pollution sources, Path of pollutants, *Wisconsin, Loams, Sands, Irrigation, Soil analysis.
Identifiers: Plainfield loamy sand(Wis), Hancock(Wis), Nitrate-nitrogen.

The results of a field experiment show that rainfall and/or irrigation can move NO2-N beyond the rooting zone of Plainfield loamy sand. Leaching under intensive irrigation was evaluated over an 11-day period. KNO3 and KCl were used as fertilizers. The NO3 and Cl concentration was determined in soil profile and lysimeter leachate samples collected daily. Water in the amount of 2.5 cm moved 19 cm in the surface and 28 cm in subsurface soil. Chloride concentrations were similar to those of NO3-N. (Carpenter-FIRL)
W75-04997

WATER QUALITY AFTER CLEARCUTTING A SMALL WATERSHED IN WEST VIRGINIA,
Forest Service (USDA), Parsons, W. Va. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W75-04998

PHOSPHOROUS ASSOCIATED WITH SEDIMENTS IN IRRIGATION AND DRAINAGE WATERS FOR TWO LARGE TRACTS IN SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
D. L. Carter, M. J. Brown, C. W. Robbins, and J. A. Bondurant.
Journal of Environmental Quality, Vol 3, No 3, p 287-291, July-September, 1974. 5 tab, 18 ref.

Descriptors: *Phosphorus, *Quality control, *Irrigation, *Drainage, *Idaho, Sediments, Water pollution sources.
Identifiers: Snake River(Ida).

Phosphorus was measured in irrigation and surface drainage water. Present practices remove more phosphorus from the Snake River in irrigation than is returned in drainage; new practices could be implemented for phosphorus conservation. Due to particle size preparation in drainage streams, finer sediments return to the river containing higher phosphorus concentrations than the soils from which they were eroded. The importance of defining sampling methods and procedures is illustrated by comparative data on irrigation and drainage waters. (Carpenter-FIRL)
W75-04999

OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. W. Devanney, R. J. Stewart, and W. Briggs.
In: Primary, Physical Impacts of Offshore Petroleum Developments, MITSG 74-20, p 213-403. 87 fig, 13 tab, 28 ref.

Descriptors: *Oil spills, Movement, *Migration, Winds, Littoral drift, Ocean currents, Atlantic Ocean, Continental shelf, Northeast US, Ocean waves, Deep water, Computer models, *Alaska.
Identifiers: *Oil spill trajectories, Mid-Atlantic Ocean, South-Atlantic Ocean, *Gulf of Alaska, Buzzards Bay(Mass), Delaware Bay(Dela), Charleston Harbor(Md).

The likely behavior of oil spill trajectories from each of the thirteen potential Atlantic outer continental shelf production regions and each of the nine potential production areas in the Gulf of Alaska are analyzed by a simple computer model. Also examined in detail is the probable behavior of oil spills emanating from three potential nearshore terminal areas, Buzzards Bay, Delaware Bay, and Charleston Harbor. The emphasis in all these analyses is on the probability of a spill coming ashore, the time to shore, and in the terminal analyses, the wind conditions at the time the spill first reaches the shore. The analyses of the terminal areas are exemplary and indicate the type of work which should be done in any terminal area under consideration and should also include a series of offshore locations of varying distances from the coast to help assess the tradeoffs associated with placing terminals further at sea. No attempt has been made to establish anything but the grossest sort of feel for the problem and the next step would appear to require some focusing of effort with respect to a particular nearshore region, and a more definite specification of the functions required of a transshipment site. (See also W75-05032) (Auen-Wisconsin)
W75-05035

THE ROLE OF MASS TRANSPORT IN OIL SLICK WEATHERING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. B. Lassiter, R. J. Powers, and J. W. Devanney.
In: Primary, Physical Impacts of Offshore Petroleum Developments, MITSG 74-20, p 404-448, 17 fig, 2 tab, 20 ref.

Descriptors: *Mass transfer, *Oil spills, Weathering, Diffusion, Sedimentation, Evaporation, Mathematical models, Ocean waves, *Path of pollutants.
Identifiers: *Oil slicks, Hydrocarbons, Benzene, Napthalene.

The vertical dispersion of soluble hydrocarbons beneath an oil slick was modeled mathematically as a classical diffusion problem with the following indications: The mass transfer of light aromatics from an oil slick progresses through three stages.

During the first stage, soluble hydrocarbons from the upper layers of the slick are evaporated into the adjacent air while those from the lower layers are dissolved in the water. During the second stage, evaporative hydrocarbons continue to diffuse from immediately beneath the slick. During the third stage, evaporation draws soluble hydrocarbons from the water back through the slick into the air. Benzene in slicks of 1 mm thickness lasts approximately 6 hours but biologically important concentrations can be found to a 3 or 4 m depth and can persist for a long time after the surface slick has disappeared. Napthalene leaves the slick very slowly and biologically important concentrations can remain to a depth of 1 meter. All compounds with a carbon number of less than 9 will be gone from the slick in a matter of hours while alkanes with carbon numbers of 9 and above will remain much longer. (See also W75-05032) (Auen-Wisconsin)
W75-05036

'EUTROPHICATION'--ITS CAUSES AND EFFECTS IN FRESH WATER LAKES,
New York State Dept. of Environmental Conservation, New Paltz.
For primary bibliographic entry see Field 5C.
W75-05038

THE INDICATOR ORGANISMS AND THEIR ECOLOGICAL VARIABILITY,
Water Economics Research Inst., Krakow (Poland). Dept. for Water Protection.
For primary bibliographic entry see Field 5C.
W75-05055

EFFECT OF TIME OF IRRIGATION ON THE DISTRIBUTION OF 1,2-DIBROMO-3-CHLOROPROPANE IN SOIL AFTER SHALLOW INJECTION,
California Univ., Davis. Dept. of Nematology.
L. R. Hodges, and B. Lear.
Pestic Sci, Vol 4, No 6, p 795-799, 1973.
Identifiers: *Distribution, Injection, Irrigation, *Pesticides, *Propanes, Soils, Dispersion, Organic compounds, *Path of pollutants.

The effect of irrigation time on the dispersion of 1,2-dibromo-3-chloropropane (DBCP) in soil after a shallow injection treatment was determined for Yolo fine sandy loam. When injections equivalent to 23.51 of DBCP/ha at a depth of 7-8 cm were subsequently followed by 15 cm of irrigation water, adequate distribution of DBCP was obtained if the soil was irrigated within 5 days. However, the most rapid and deepest penetration of fumigant was obtained by irrigating 2-5 days after application. There was insufficient downward movement of DBCP in non-irrigated soil.--Copyright 1974, Biological Abstracts, Inc.
W75-05065

VOLATILIZATION LOSSES OF PESTICIDES FROM SOILS,
California Univ., Riverside.
W. J. Farmer, and J. Letey.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Environmental Protection Agency, Technology Series Report, EPA-660/2-74-054, August 1974. 80 p, 7 fig, 10 tab, 37 ref, 2 append. EPA Grant No. R 801835.

Descriptors: *Pesticides, *Organochlorine insecticides, Herbicides, *Volatilization, Lindane, Dieldrin, DDT, DDE, Diffusion, Adsorption, Water pollution sources, *Path of pollutants, Computer models.
Identifiers: Pesticide runoff models, Trifluralin, Vapor density, Transport processes, Mass flow.

The volatilization of pesticides following soil application can be predicted from considerations of the physical and chemical principles controlling concentrations at the soil surface. When these concentrations are maintained at a relatively high level, volatilization losses will be determined by the pesticide vapor pressure as modified by adsorptive interactions with the soil. For pesticides which have been mixed with the soil or when volatilization has been proceeding for a time so that concentrations at the soil surface are low, volatilization rates will be determined by the rate at which pesticides move through the soil to the soil surface. Under conditions when mass flow in liquid water is negligible, volatilization rates are predictable using solutions to the diffusion equations. When mass flow is operative the prediction of rates of volatilization are more complex. A computer model has been developed combining both diffusion and mass flow for predicting the volatilization of soil-incorporated pesticides. Temperature gradients in soil significantly affected the distribution of volatile pesticides in soil. Vapor phase diffusion toward areas of low temperature can occur simultaneously with mass flow in liquid water toward areas of high temperature. (EPA)
W75-05075

LOSSES OF FERTILIZERS AND PESTICIDES FROM CLAYPAN SOIL,
Missouri Univ., Columbia. Dept. of Agronomy.
G. E. Smith, F. D. Whitaker, and H. G. Heinemann.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.45. Environmental Protection Agency, Ecological Research Series Report, EPA-660/2-74-068, July 1974. 75 p, 12 fig, 16 tab, 28 ref, append. EPA Project R-801-666.

Descriptors: Water pollution, Agricultural chemicals, *Fertilizers, Nitrates, Phosphates, *Pesticides, Sediments, Erosion, Runoff, Eutrophication, Soil management, *Path of pollutants, *Soil analysis, Nutrients.
Identifiers: *Claypan soil.

Analyses of runoff and sediment were made from 33 instrumented plots at the Midwest Claypan Experiment Station. Nitrogen compounds, phosphates and some specific pesticides were determined where fertilizer treatments, cropping and cultural practices varied. The results show the losses of nitrogen and phosphate compounds that may be expected under practical field conditions on soils that have a minimum slope and where percolation rates are slow. Results from three seasons are reported. In all three years rainfall during the critical period, where there was minimum ground cover, was below long time averages. Optimum fertilization treatments that produced a vigorous canopy, or a good residue cover reduced both erosion and nutrient losses. In none of the three years did the optimum use of fertilizer or pesticides produce large losses of chemicals. The results point to systems of soil management that will produce optimum yields of grain crops with a minimum contamination of receiving water by chemicals. (EPA)
W75-05081

ESTIMATING NUTRIENT LOADINGS OF LAKES FROM NON-POINT SOURCES,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5C.
W75-05082

PESTICIDES IN THE ILLINOIS WATERS OF LAKE MICHIGAN,
Environmental Protection Agency, Chicago, Ill.
R. A. Schacht.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.25. Environmental Protection Agency, Ecological Research Series Report, EPA 600/3-74-002, January 1974. 55 p, 2 fig, 8 tab, 8 ref, 2 append. EPA 16050 ESP.

Descriptors: *Pesticides, *Polychlorinated biphenyls, *Lake Michigan, *Fish, *Sediments, Insecticides, Organic pesticides, Chlorinated hydrocarbon pesticides, Aldrin, DDD, DDE, DDT, Dieldrin, Endrin, Heptachlor, Aroclors, Effluents, Tributaries, Lake sediments, Salmon, Carp, Yellow perch, Brown trout, Pollutants, Pollutant identification, Water pollution, Water quality, *Illinois.
Identifiers: Heptachlor epoxide, Lindane, Methoxychlor, Phthalates, Chicago(Ill), Waukegon(Ill), Alewife, Coho salmon.

This study was initiated to determine present levels of pesticides in Lake Michigan fish, sediments, and water. Data were collected on six species of Lake Michigan fish (yellow perch, chubs, carp, coho salmon, alewife, and brown trout); open lake and tributary stream and ravine sediments; and open water, tributary stream, and sewage treatment plant effluents. Samples were analyzed for the following: heptachlor, heptachlor epoxide, dieldrin, methoxychlor, lindane, aldrin, endrin, DDT and its analogs. Additional analyses were accomplished for polychlorinated biphenyls (PCB's), di-n-butyl phtalate (DBP), and di (2-ethylhexyl) phthalate (DOP). PCB's were found at levels as high or higher than DDT in Lake Michigan water, sediment, and fish. PCB's have been found to complicate the routine analysis of DDT which may have caused earlier DDT data in the literature to be reported at levels higher than actual. Both DDT and the polychlorinated biphenyls were found at levels which cause concern for aquatic life and warrants the controlled use of these compounds. (EPA)
W75-05083

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS,
East Central State Coll., Ada, Okla. School of Environmental Science.
For primary bibliographic entry see Field 10B.
W75-05084

EVALUATION OF DRAINAGE FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-05090

DEVELOPMENT OF CLASSIFICATION SCALE FOR CHARACTERIZING BILGEWATERS USED IN EVALUATING OIL REMOVAL TECHNIQUES,
General American Transportation Corp., Niles, Ill. General American Research Div.
For primary bibliographic entry see Field 5G.
W75-05091

ARTIFICIAL SEA SLICKS: THEIR PRACTICAL APPLICATIONS AND ROLE IN FUNDAMENTAL RESEARCH,
Naval Research Lab., Washington, D.C.
W. R. Barger, and W. D. Garrett.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-780 784, $3.25 in paper copy, $2.25 in microfiche. Report 7751, June 4, 1974. 13 p, 6 fig, 16 ref, append.

Descriptors: *Monomolecular films, *Oceans, *Surfaces, Waves(Water), Capillary action, Ocean waves, Chemistry, Gravity waves, *Oil spills, Oil pollution, Organic compounds, *Path of pollutants, Water pollution control.
Identifiers: *Air-sea interactions, *Oil-control films, Wave damping, Underwater visibility, Oleyl alcohol.

Artificial sea slicks are man-made, monomolecular, organic films adsorbed at the air-sea interface. They are formed from spontaneously spreading, water-insoluble polar liquids. Techniques for

generating artificial sea slicks from surface vessels and from the air were devised. The chemical structure of the film-forming material to be used in a specific sea slick application was determined by the air-sea parameter to be modified and by the desired longevity of the slick. Research into the chemical modification of air-sea interactions led to several practical applications for artificial sea slicks. The ability of organic surface films to damp capillary waves renders the area covered by the film highly visible and sensible under most environmental conditions. The attenuation of both capillary and high-frequency gravity waves by artificial sea slicks was examined under open-ocean conditions. The wave-damping property was used as a basis for the development of seamarkers that generate highly visible, persistent ripple-damped zones on the sea surface. Field research also demonstrated that slicks do not enhance underwater visibility but can markedly improve the clarity of objectives beneath the water when viewed through a air-water interface. Large artificial slicks were used as a tool to elucidate the mechanisms of wind-wave interactions and air-sea exchange processes. The most widely used application of film-forming organic chemicals is for the control and containment of oil spills. By greatly altering surface forces, these films cause the oil to draw back into a thicker layer that occupies a considerably reduced area of the water surface, thereby facilitating and increasing the efficiency of oil retrieval operations. (Sims-ISWS)
W75-05092

A REVIEW OF THE LITERATURE CONCERNING THE STEEL INDUSTRY AND POLLUTION. PART 1. THE BACKGROUND TO POLLUTION,
British Steel Corp., Sheffield (England). Information Services.
For primary bibliographic entry see Field 5G.
W75-05093

WEATHERING OF OIL AT SEA,
Esso Research and Engineering Co., Linden, N.J. Government Research Div.
J. W. Frankenfeld.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-787 789, $7.00 in paper copy, $2.25 in microfiche. Report No CG-D-7-75, September 1973. 175 p, 49 fig, 40 tab, 41 ref, 2 append. DOT-CG-23035-A.

Descriptors: *Weathering, *Oil pollution, *Oil spills, *Chemical degradation, Analytical techniques, Biochemistry, Chemical analysis, Environmental effects, Spectroscopy, Laboratory tests, Specific gravity, On-site investigations.

A study was conducted to trace the fate of petroleum products discharged in the marine environment and to determine the magnitude of the more important weathering variables on the physical and chemical changes which occur. Six carefully selected oils, four crudes and a heavy and a light fuel oil, were weathered under controlled, laboratory conditions in specially designed simulators and under 'real marine' conditions. The progress of weathering was monitored by measuring such physical changes as average boiling points (evaporation rates) and the increase in specific gravity. The effects of weathering parameters on chemical changes in both the floating oil slick and in the aqueous phase below the slick were also measured. The environmental variables investigated included air and water temperature, water wash rate, effects of salinity, effects of air movement and UV light, as well as weathering time (up to four months). The results indicated that the most important variables were the chemical characteristics of the petroleum products themselves. Variation between oils was much greater than those brought about by changes in weathering parameters. However, the environmental factors studied did have observable effects on the final disposition of the weather oils. Details of the analytical procedures and some additional data were presented in appendexes. (Sims-ISWS)
W75-05106

NUMERICAL MODELS FOR PRECIPITATION SCAVENGING,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
Y. Lee.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-140752, $8.00 in paper copy, $2.25 in microfiche. PhD Disseration, April 1974. 89 p, 17 fig, 2 tab, 71 ref, 1 append. AEC Contract AT(11-1)-1407.

Descriptors: *Clouds, *Model studies, *Cloud physics, Precipitation(Atmospheric), Raindrops, Evaporation, Measurement, On-site investigations, Numerical analysis, Convection, Fallout, Efficiences, *Path of pollutants.
Identifiers: *Precipitation scavenging, Stratiform clouds, Diffusive attachment, Impact collection, Accretion, Cloud droplet-size spectra, Contaminant particles, Liquid water content, Microphysics.

Two models for precipitation scavenging were developed. The first was for scavenging in stratiform clouds incorporating heuristic approximations of diffusive attachment, impact collection, and accretion including particle and cloud droplet-size spectra. Rainout ratios and efficiencies were computed and, when compared with available field measurements, revealed that: (1) the attachment or removal rate is not constant, (2) the contaminant concentration in the cloud decreses exponentially with time, and (3) the fraction of air concentration of contaminant attached to cloud droplets is affected by processes of particle attachment and rainfall removal. The second model addressed the convective precipitation process in which raindrop growth and motion in spatial contaminant concentration gradients are important. Numerical solutions for raindrops growing by coalescence with cloud drops and moving in a cylindrically symmetric motion field within a steady-state cloud were found. Drop breakup and evaporation were taken into account. Because the updraft core is identified with the maxima of liquid water content and contaminant concentrations, (1) coalescence is most rapid where droplets are moving upward through the cloud and (2) the highest concentration of contaminant tends to be found with the larger drops near the axis of the cylinder. Because the small drops evaporate sooner than the large drops in the subcloud air, a negative correlation between contaminant concentration and rainfall rate was indicated. (Jones-ISWS)
W75-05112

WATERBORNE DEBRIS IN MARINE POLLUTION INCIDENTS,
Battelle Columbus Labs., Long Beach, Calif. Long Beach Research Facility.
J. A. Hancock, R. P. Jacobs, M. R. Knapp, and J. S. Glasgow.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 568, $11.50 in paper copy, $2.25 in microfiche. Report No. CG-D-108-74, March 1974. 460 p, 6 fig, 2 tab, 20 append. DOT-CG-23223-A-11.

Descriptors: *Wastes, *Oil spills, *Water pollution sources, Coasts, Data collections, Harbors, Water pollution control, Estuaries, Water pollution effects, Equipment, *Path of pollutants.
Identifiers: *Waterborne debris, Debris cleanup equipment.

Floating debris has greatly hindered the cleanup of spilled fluids in several pollution instances. This debris has hampered the use of pollution-response equipment and has presented a major materials-handling and disposal problem. The types of waterborne debris found in coastal, harbor, and estuarine areas were described. Regional variations of the types and quantities of debris, the sources of this debris, and natural effects on concentration and quantity were described. Current debris-handling practices used in oil spills were investigated. Equipment used for handling debris was identified and evaluated. Other equipment not now used for debris handling in spills, but showing potential, was considered. Necessary performance considerations for debris-handling equipment were listed. Effects of debris on pollution-response equipment were established. Current design features and protection techniques to minimize or negate debris effects were also investigated. (Sims-ISWS)
W75-05114

SEEPAGE-ENVIRONMENTAL ANALYSIS OF THE SLIME ZONE OF A TAILING POND,
Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
C. D. Kealy, R. A. Busch, and M. M. McDonald.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 989, $3.75 in paper copy, $2.25 in microfiche. Report of Investigation 7939, 1974. 89 p, 15 fig, 4 tab, 15 ref, 2 append.

Descriptors: *Seepage, *Finite-element analysis, *Water quality, Dissolved solids, Suspended solids, Groundwater, Trace elements, Mathematical models, Resistivity, Piezometers, Seismic studies, Permeability, Rainfall, Model studies, Data collections, *Washington.
Identifiers: *Tailings ponds, Slime zone, Grain-size analysis, Shelby tube sampling, Van Stone tailing pond(Wash).

Dissolved and suspended solids are present in the free water of tailings ponds. The influences of the slime zone in preventing these solids from reaching the environment outside the tailing pond were identified. The finite-element method was used to determine the rate of discharge of subsurface water from the Van Stone tailings pond in northern Washington. The slime zone was sampled and tested for the first time, and results were interpreted and incorporated into the mathematical model. Computer results were verified by installing and monitoring piezometers in the field and by a simulated laboratory model. Output from the numerical model defined critical seepage zones and revealed that proper pond design and maintenance can reduce pond seepage losses to a minimum. Minimization of seepage requires maintaining the pond water level over the slime zone. Sufficient physical, chemical, and limnological data were collected and analyzed to conclude that the only realistic reflection of synergistic effects is obtained by study of the indigenous biota in combination with quantitative chemical and physical data. Proper planning and management of the milling and waste disposal operations are the key to minimal pollution. (Schict-ISWS)
W75-05115

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM - VOLUME II - DESIGN REPORT.
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W75-05119

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM - VOLUME III - SUBSYSTEM SPECIFICATIONS.
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W75-05120

THE FATE OF NITRATE IN LAKE SEDIMENT COLUMNS,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. L. Chen, and D. R. Keeney.
Water Resources Bulletin, Vol 10, No 6, p 1162-1172, December 1974. 4 fig, 3 tab, 14 ref. EPA Grant No R-801362.

Descriptors: *Path of pollutants, *Lake sediments, *Denitrification, *Leaching, *Nitrogen compounds, *Oxidation-reduction potential, Sediments, Lake beds, *Nitrates, Nitrites, Nitrogen, Sediment-water interfaces, Surface-groundwater relationships, Water quality, Seepage, Lakes, *Wisconsin.
Identifiers: Lake Mendota(Wis), Lake Tomahawk(Wis).

Undisturbed core samples of sediments (40 cm length) from Lakes Mendota and Tomahawk were leached from the bottom, at 1.4 cm/day, with a solution N15-nitrate (10 mg N/liter) to investigate the magnitude of denitrification and assimilatory nitrate reduction of nitrates reaching lake sediments by way of groundwater seepage. Oxidation-reduction potentials were measured daily in the core columns at 4-, 14-, 24-, and 34-cm depths. Water samples were collected daily and concentrations of soluble organic N, NH4-N, NO3-N, and NO2-N were determined. After 50 days of leaching, sediment cores were removed from the columns, sectioned at 10-cm intervals, and the amounts and forms of nitrogen were determined. While leaching removed considerable ammonium-N (NH4-N) and soluble organic N, essentially no N15 had passed through the columns. Oxidation-reduction potentials indicated that denitrification occurred in the lower depths. The N15 distributions of sediment nitrogen showed that 15 to 26% of added nitrate-N (NO3-N) was converted to organic N and ammonium-N. (Harmeson-ISWS)
W75-05155

MONITORING MARINE OUTFALLS BY USING ULTRAVIOLET ABSORBANCE,
Victoria Univ. (British Columbia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W75-05159

HYDROGEOCHEMISTRY OF CARBONATE GROUNDWATERS OF AN URBAN AREA,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2F.
W75-05163

DISPERSION OF DREDGE SPOIL DUMPED IN NEAR-SHORE WATERS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
R. B. Gordon.
Estuarine and Coastal Marine Science, Vol 2, No 4, p 349-358, October 1974. 5 fig, 1 tab, 4 ref.

Descriptors: *Path of pollutants, *Dredging, *Dispersion, *Turbidity, Silts, Tidal streams, Measurement, Sediments, Suspended solids, *Connecticut.
Identifiers: *Dredge spoil, *Dumping operations, Marine silt, Residual turbidity, Spoil drop site.

Turbidity measurements made at the New Haven spoil ground in Long Island Sound showed that 99% of non-cohesive spoil of high silt content discharged from a scow in the presence of a tidal stream was transported to the bottom as a high speed, turbulent jet. Lateral spread of the jet was about 30% of the water depth. Impact with the bottom produced an outward spreading density current whose speed and thickness varied such that the Froude number of the flow remained about constant. When 2000 cu m of spoil was discharged in water 20 m deep, the density surge carried less than 18% of the spoil outside a circle of 30-m radius and essentially none beyond about 120 m. The residual turbidity in the water column, which drifted with the tidal stream, contained less than 1% of the material discharged; this settled at the fall velocity of the individual particles. (Roberts-ISWS)
W75-05167

THE GEOLOGY AND HYDROGEOLOGY OF THE NEW LEAD BELG, MISSOURI,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 2F.
W75-05175

SOURCES AND TRENDS IN WASTE WATER LOADINGS TO THE SAN FRANCISCO BAY REGION,
Sir George Williams Univ., Montreal (Quebec). Dept. of Economics.
J. A. Breslaw.
Water Resources Research, Vol 10, No 6, p 1085-1089, December 1974. 3 fig, 1 tab, 9 ref, 1 append.

Descriptors: *Path of pollutants, *Biochemical oxygen demand, *Heavy metals, *Nutrients, *Regression analysis, *Phenols, Estuaries, Nitrogen, Phosphorus, Heated water, Industrial wastes, Regional analysis, Tidal effects, Waste water(Pollution), Water pollution, *California.
Identifiers: *San Francisco Bay(Calif).

A study based on data obtained from the U.S. Army Corps of Engineers Permit Program and the regional quality control board indicated that the municipal BOD load discharged to San Francisco Bay in 1971 was less than it was in 1961. On the other hand, flows, total phosphorus, total nitrogen, and population have all shown increasing trends in the same time period. The major source of heavy metals appeared to be from municipal discharges instead of industrial sources. For each waste constituent a few plants were responsible for most of the aggregate loadings of that constituent. For the Bay as a whole, muncipalities were the major dischargers of all waste constituents with the exception of heat and phenols; however, industrial discharges were significant in some reaches. (Harmeson-ISWS)
W75-05186

A MODEL TO STUDY THE EFFECTS OF TIME-VARIABLE POLLUTANT LOADS ON STREAM QUALITY,
Saint Catharines (Ontario).
J. Warren, and J. K. Bewtra.
Water Research, Vol 8, No 12, p 1057-1061, December 1974. 7 fig, 4 ref.

Descriptors: *Path of pollutants, *Computer models, *Combined sewers, *Detention reservoirs, *Suspended solids, Biochemical oxygen demand, Interceptor sewers, Coliforms, Phosphates, Mathematical models, Alternative costs, Economics, Model studies, Pollution abatement, Water quality.

A deterministic computer model was used in a study of the effects of discharge from combined sewers on the quality of receiving bodies of water. Included in the model were cost functions for all systems components and the capability for studying the effects of varying treatment plant and interceptor sewer capacities on stream quality. Results of a series of model runs on three drainage areas showed the variation of total mass phosphate discharge, the peak instantaneous phosphate concentration, and the costs of varying system parameters. The computer model was proposed as a useful tool in predicting stream quality variations and arriving at feasible and economical solutions to combined sewer overflow problems. (Harmeson-ISWS)
W75-05187

MANAGEMENT OF WASTE FLUIDS IN SALAQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
R. G. Kazmann, O. K. Kimbler, and W. R. Whitehead.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR4, Proceedings Paper 10991, p 413-424, December 1974. 7 fig, 15 ref, 1 append. A-002-LA(8), A-011-LA(4), A-022-LA(4), A-027-LA(4).

Descriptors: *Aquifer management, *Waste disposal wells, *Groundwater movement, *Underground storage, Groundwater, Confined water, Percolating water, Aquifers, Sinks, Saline water, Injection wells, Waste disposal, Industrial wastes, Pollutants, Environmental engineering, Deep wells.
Identifiers: *Saline groundwater, *Salaquifers, Miscible displacement.

The disposal of liquid wastes into suitable aquifers that contain saline water (salaquifers) has proven to be technically feasible. The practice is widespread and the total number of waste-injection wells operating in the United States reached almost 270 by 1972. If the waste is heavier than the water in the storage aquifer, the waste will tend to move downdip until it reaches a boundary or the axis of a syncline. Thus, chances are very small that the waste will escape through the roof of the salaquifer. Therefore, the dip of the aquifer, the direction and rate of preexisting groundwater movement, and the density difference between native and injected fluids (assumed to be miscible) are the most significant parameters for evaluating possible safety (and success) of the project. (Prickett-ISWS)
W75-05191

TEMPERATURE INDUCED VARIATIONS OF KINETIC COEFFICIENTS FOR TEXTILE-DOMESTIC WASTE MIXTURES,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-05264

GROWTH KINETICS OF NITRIFYING MICROORGANISMS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-05267

DETERMINATION OF THE EFFECT OF CARBONACEOUS SUBSTRATE CONCENTRATION ON THE RATE OF NITRIFICATION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-05268

NITROGEN REMOVAL OBTAINED THROUGH HETEROTROPHIC GROWTH IN TRICKLING FILTERS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-05269

SEEPAGE FLOWS - GROUNDWATER POLLUTION INVESTIGATIONS,
Rutgers - The State Univ., New Burnswick, N.J. Dept. of Civil and Environmental Engineering.
E. L. Bourodimos, and T. J. Harlukowicz.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 959, $3.75 in paper copy, $2.25 in microfiche. Partial Completion Report, January 1975. 41 p, 6 fig, 6 tab, 55 ref. OWRR A-027-NJ(4). 14-31-0001-3830.

Descriptors: *Groundwater movement, *Soil water movement, Groundwater, Permeability, Porosity, Dispersion, Percolation, Water pollution sources, *Seepage, *Path of pollutants.
Identifiers: Soil isotrophy.

Soil structure, ground water flows and pollutant dispersal from field and laboratory tests were investigated. Soil structure characteristics at the

Adelphia Experimental Station were evaluated through measurements in situ and field data analysis in the laboratory. An attempt was made to evaluate the longitudinal concentration profiles and dispersion coefficient in a soil column from field samples with a step input pollutant substance. Fluorometer techniques and Rhodamine WT were employed in the laboratory research tests. Due to significant soil absorption rates the dispersion measurements were not conclusive with the fluorometry method available. Measurements in situ of coefficients of permeability and groundwater fluctuations and hydraulic gradients were successfully completed.
W75-05273

PROCEEDINGS OF THE FIRST ANNUAL NSF TRACE CONTAMINANTS CONFERENCE.
Oak Ridge National Lab., Tenn.
Available from the National Technical Information Service, Springfield, Va 22161 as CONF 730 802. Held August 8-10, 1973, Oak Ridge, Tennessee, Published by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, 775 p. NSF AG-395 W7405-eng-26.

Descriptors: Model studies, *Trace elements, *Distribution patterns, *Pollutant identification, *Path of pollutants, *Trace elements, *Heavy metals, Conferences, Lead, Cadmium, *Analytical techniques, Zinc, Industrial wastes, Sampling, Mercury, Sediments, Estuaries, Nickel, Aqueous solutions, Absorption, Oysters, Arsenic, Aerosols, Spectroscopy, Chromatography, Colorimetry, X-rays, Fluorescence, Human physiology, Organic compounds, Corn(Field), Toxicity.
Identifiers: Molybdenum.

This volume is a compilation of much of the available knowledge on the subject of trace contaminants. Papers included in the book were presented at the First Annual NSF Trace Contaminants Conference held in Oak Ridge, Tennessee, August 8-10, 1973. Discussion material has been added to most of these papers to improve their content and readability. The book gives a comprehensive coverage of the topic by dividing the papers into groups corresponding to the sessions of the conference: a tri-university report on the status of environmental contamination by lead; problems with modeling transport and biological translocation; problems with measurement of sources and environmental levels; sampling strategy and analytical measurements; transport and ecosystem modeling; ecological and biomedical effects and measurements; measuring environmental distribution and cycling; and problems with and opportunities for implementing the use of results from RANN programs. An author and subject index are also included. (Jernigan-Vanderbilt)
W75-05277

ANALYTICAL STUDIES OF THE SPECIATION OF MERCURY, ARSENIC AND ANTIMONY,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-05278

DETERMINATION OF TRACE ORGANIC CONTAMINANTS IN NATURAL WATERS BY HIGH-RESOLUTION LIQUID CHROMATOGRAPHY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W75-05280

HUMAN HAIR AS AN INDICATOR OF TRACE METAL ENVIRONMENTAL EXPOSURE,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-05283

PRELIMINARY DETERMINATIONS OF TRACE METALS IN HI-VOL PADS AND SOILS AROUND THE SOUTH END OF LAKE MICHIGAN,
Metropolitan Sanitary District of Greater Chicago, Ill. Research and Development Dept.
For primary bibliographic entry see Field 5A.
W75-05291

DISTRUBUTION OF HEAVY METALS IN A BORROW PIT,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
T. O. Peyton, and A. W. McIntosh.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 589-598, 3 fig, 3 tab, 3 ref.

Descriptors: *Heavy metals, *On-site collections, *Borrow pits, Ponds, Highways, Cadmium, Lead, Zinc, Aquatic environment, Air pollution, Sediments, Analytical technique, Spectroscopy, *Pollutant identification, *Indiana, *Path of pollutants, *Distribution patterns.

Two systems, one of them a borrow pit and the other a small pond, lying along the Indiana Toll Road were chosen for the study of input and distribution of cadmium, lead, and zinc, in aquatic systems. The borrow pit, located in Gary, Indiana, is exposed to automative and industrial aerial deposition, while the pond, situated near Michigan City, Indiana, receives mainly automotive inputs. Initial samples from the 0-10 cm layer of sediment indicated elevated metal levels, with maximum values of 3.3 ppm cadmium, 998 ppm zinc, and 493 ppm lead in the Gary pit and 1.40 ppm cadmium, 251 ppm zinc, and 126 ppm lead in Michigan City pond (dry weight basis). Initial correlation coefficients between % organic matter and heavy metal concentrations in the Gary pit sediment were high. Cadmium: lead: zinc ratios in pit sediment, while similar to ratios in emissions from a nearby metal refining industry, also reflected a lead input from automotive sources. (See also W75-05277) (Jernigan-Vanderbilt)
W75-05292

INVESTIGATION OF ENRICHMENT OF MOLYBDENUM IN THE ENVIRONMENT THROUGH COMPARATIVE STUDY OF STREAM DRAINAGES, CENTRAL COLORADO,
Colorado Univ., Boulder. Dept. of Geological Science.
D. D. Runnells, D. Brown, and R. Lindberg.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 599-614, 8 fig, 1 tab, 10 ref. NSF(GI-3481X).

Descriptors: *Molybdenum, *Soil-water-plant relationships, *Mining, *Metals, Vegetation, Environmental effects, Industrial wastes, Mineral industry, Mine drainage, Mills, Sediments, *Colorado, Conifers, Grasses, *Path of pollutants, *Pollutant identification.

To define the natural background levels of molybdenum, Colorado areas which are geographically and environmentally similar to those which are experiencing man's influence, but which themselves have not been greatly disturbed, were chosen for investigation. Stream sediments and soils in the vicinity of streams were samples in four sites: (1) the stream draining the area of the world's largest molybdenum mine, (2) a nearby river draining a non-mineralized and undisturbed area, (3) the river below the juncture of these two streams and (4) streams draining a highly mineralized but undisturbed area. Sediments of the non-mineralized stream ranged from 2 to 6 ppm while those of the mineralized, undistrubed area ranged from 8 to 30 ppm. Soils from a mineralized undisturbed area can be an order of magnitude greater than those of a non-mineralized area. Glaciation may tend to blur these distinctions. The mixing of the highly mineralized, disturbed materials with the stream from the non-mineralized area gave intermediate values. Plant materials offer less well defined differences in the content of molybdenum from area to area. Conifer do not seem to reflect all the abundance of molybdenum in alpine environments. Stream sediments are the best indicator of molybdenum mineralization. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05293

ARSENIC DISTRIBUTION IN WATERS AND SEDIMENTS OF THE PUGET SOUND REGION,
Washington Univ., Seattle. Dept. of Oceanography.
E. A. Crecelius, and R. Carpenter.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 615-625, 4 fig, 3 ref.

Descriptors: *Arsenic compounds, *Heavy metals, Surface waters, *Environmental effects, *Path of pollutants, Copper, Industrial waters, Sediments, Air circulation, Sea water, Freshwater, *Washington, *Distribution patterns.
Identifiers: *Puget Sound(Wash).

The sources, sinks and overall biogeochemical cycle of both natural and manderived arsenic are being examined in the Puget Sound area. The natural distribution of arsenic in the sediments and waters of Puget Sound is modified by a large copper smelter which releases approximately 300 tons/year of arsenic in stack dust to the atmosphere, and roughly an equal amount in liquid effluent directly in Puget Sound. The smelter also dumps solid slag containing 1% as directly into Puget Sound. Arsenic concentrations in sediments 5-10 miles away from the smelter are 2-3 time background values. Dissolved arsenic concentrations in surface waters near the smelter are 1000 times background levels. The smelter dust which is released to the atmosphere is wind transported over 30 miles and contributes arsenic to lakes and soils over this area. The arsenic levels in the sediments of lakes downwind of the smelter have increased several fold since the smelter began operating around 1900. This report summarizes some of the interesting results of two years of analyses for arsenic in the sediments, waters, suspended matter and organisms of Puget Sound and nearby lakes and rivers. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05294

DYNAMIC REDISTRIBUTION OF METHYLMERCURY IN A POND ECOSYSTEM,
Oak Ridge National Lab., Tenn.
J. W. Huckabee, and R. A. Goldstein.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 626-639, 3 fig, 1 tab, 7 ref.

Descriptors: *Mercury, *Path of pollutants, *Model studies, *Tracers, *Detritus, Metals, Food chains, Transfer, Biomass, Ecosystems, Ponds, *Pollutant identification, *Distribution patterns.
Identifiers: *Methylmercury.

A linear, eight-compartment model was developed to describe the dynamic redistribution of methylmercury (MeHg) in a pond ecosystem following a pulse input. The eight compartments were water,

sediment, seston, benthic invertebrates, mosquitofish, bluegill, largemouth bass, and carp. Methylmercury transfers resulting from predation were assumed to be donor dependent. Eight millicuries of 203 Hg-tagged MeHg (1.81 mg of Hg) was introduced into a 1011.8 sq m pond to test the model. The pond was stocked with mosquitofish, Gambusia affinis; bluegill, Lepomis macrochirus; largemouth bass, Micropterus salmoides; and carp, Cyprinus carpio. The water, suspended detritus, plankton, invertebrates, fish and sediments were sampled periodically and assayed for 203 Hg activity. Preliminary analyses indicated the need to model biomass as well as MeHg dynamics where there were large fluctuations in trophic level biomass, since predation rate between trophic levels is a function of the relative sizes of the levels. Seston, especially plankton-organic detritus, was found to be the major reservoir of MeHg in the system during the time frame of the experiment. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05295

PATTERNS OF TRACE-ELEMENT DISTRIBUTION IN A FORESTED WATERSHED,
Oak Ridge National Lab., Tenn.
R. I. VanHook, W. F. Harris, G. S. Henderson, and D. E. Reichle.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 640-656, 4 fig, 5 tab, 12 ref.

Descriptors: *Forest watersheds, *Path of pollutants, *Metals, Vegetation, *Soil-water-plant relationships, Ecosystems, Transfer, Model studies, Soil contamination, Mass spectrometry, *Trace elements, Forests, *Pollutant identification, *Tennessee.
Identifiers: Biogeochemical cycles.

Concentrations of Al, B, Ba, Br, Cd, Cl, Cr, Mn, Ni, Pb, and Zn were determined in leaf, twig, branch, bole, and root components of the major tree species (chestnut oak, tulip poplar, shortleaf pine, hickory, black gum, dogwood, and sourwood) on Walker Branch Watershed in east Tennessee. Concentrations of Cd, Pb, and Zn decreased from young (twig) to old (bole) vegetative components; these patterns were not as obvious for the other elements studied. Hickory concentrated more elements than did any other tree species. Shortleaf pine exhibited higher levels of Al, Br, and Cl than the other tree species examined. Decomposing litter exhibited the highest concentrations of all elements for any biotic component examined in the forest; Cd, Pb, and Zn were characteristically found in greatest amounts in humic materials. Zones of accumulation were observed in lower soil horizons for all elements studied. This continuing research on trace-element dynamics in the environment emphasized biogeochemical cycles in ecosystems. The ultimate objective is the development of an environmental transport model and data sets which couple the hydrologic cycle with regulating ecological processes for watershed units of the landscape. The first stage of this research is presented as the quantification of trace-element concentrations in major biotic and abiotic components of a forested ecosystem. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05296

ACCUMULATION OF AVAILABLE MOLYBDENUM IN AGRICULTURAL SOILS IRRIGATED WITH HIGH-MOLYBDENUM WATERS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
D. R. Jackson, W. L. Lindsay, and R. D. Heil.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 657-667, 6 fig, 6 ref.

Descriptors: *Molybdenum, *Soil-water-plant relationships, *Irrigation, *Transfer, *Path of pollutants, Forages, Cattle, Anion exchange, Alfalfa, *Colorado, Livestock, Industrial wastes, Vegetation, Agriculture, *Pollutant identification.

Some of the irrigation waters in the front range of Colorado and elsewhere are relatively high in molybdenum. The purpose of this research was to determine whether this molybdenum might accumulate in forages to the extent of being hazardous to grazing livestock. Anion exchange resin was used as a soil test to monitor available molybdenum in several soil profiles. Resin extractable molybdenum was highly correlated with the molybdenum concentration in alfalfa. Aqueous suspensions of three calcareous soils were made at soil-to-water ratios of 1:1, 1:5, 1:10 and 1:50 to determine the effect of dilution on water-soluble molybdenum. At the 1:50 ratio as much as 75% of the total soil molybdenum was solubilized. Results showed that molybdenum applied to calcareous soils low in indigenous molybdenum remained labile. Therefore, applications of high-molybdenum irrigation waters may result in excessive levels of molybdenum in forages. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05297

ROOT DEVELOPMENT AND NUTRIENT UPTAKE BY CORN GROWN IN SOLUTION CULTURE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W75-05305

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
C. T. K. Ching, and G. E. Frick.
In: Growth and Change, A Journal of Regional Development, Vol 5, No 4, p 15-20. October, 1974, 1 fig, 2 tab, 3 ref. OWRT A-026-NH (3) 14-31-0001-3229.

Descriptors: *Water quality, *Environmental effects, *Parks, *Attitudes, Surveys, Climates, *New Hampshire, *State parks, Recreation, Lakes.
Identifiers: Attitudinal surveys, Summer homes, *Pawtuckaway State Park (NH), Pawtuckaway Lake(NH).

Pawtuckaway State Park has been operating since 1966. This large rural park fronts on a portion of Pawtuckaway Lake which is 800 acres in size. Numerous clusters of seasonal houses are adjacent to the shoreline and the park. During the summer of 1971 an intensive study was made of (1) lake water quality as affected by park usage, and (2) the attitudes of private water-oriented landowners toward the park. Both the water quality analysis and the attitudinal survey indicated that the establishment of Pawtuckaway State Park has not had an adverse effect on the quality of the immediate environment. Coliform bacteria, a water quality indicator, occasionally exceeded the State standard at the beach area. However, neither climate, attendance, weekend use (As high as 8,000 people) nor time were significant determinants of the coliform level. The majority of the 90 landowners interviewed held favorable attitudes toward the park, including an opinion that the park improved their property values.
W75-05306

HOW TO INCORPORATE WATER QUALITY AND POLLUTION CONSIDERATIONS INTO THE MODEL OF THE WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05321

LATERALLY INTEGRATED NUMERICAL WATER QUALITY MODEL FOR AN ESTUARY,
Rhode Island Univ., Kingston. Dept. of Oceanography.
M. L. Spaulding.
Journal of Fluids Engineering, Vol 96, No 2, p 103-110, June, 1974. 12 fig, 23 ref.

Descriptors: *Estuaries, *Water quality, *Water pollution sources, Biological oxygen demand, Storm drains, Mathematical models, *Rhode Island, *Path of pollutants.
Identifiers: Narragansett Bay(RI).

A two-dimensional, laterally integrated, estuarine, numerical water quality model was developed and applied to the dissolved oxygen-biochemical oxygen demand system of Narragansett Bay, Rhode Island. It exhibited agreement with the existing data in predicting vertical structure. An application of the model to storm-sewage overflow for the Bay also exhibited a favorable comparison to the existing data. (Leibowitz-FIRL)
W75-05323

ECOLOGICAL EFFECTS OF NUCLEAR STEAM ELECTRIC STATION OPERATIONS ON ESTUARINE SYSTEMS, VOL. 2.
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05342

ECOSYSTEM MODELING: EFFECTS OF TEMPERATURE ON ESTUARINE MICROCOSMS,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W75-05346

SECOND ANNUAL REPORT, DOT-CIAP PROGRAM,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2B.
W75-05349

PUERTO RICO NUCLEAR CENTER, ANNUAL REPORT, 1973.
Puerto Rico Univ., San Juan.
For primary bibliographic entry see Field 5A.
W75-05350

5C. Effects Of Pollution

CONTINUOUS-FLOW STUDIES OF PHOSPHORUS AS A LIMITING NUTRIENT FOR CAYUGA LAKE PHYTOPLANKTON.
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
J. P. Barlow, B. J. Peterson, and A. E. Savage.
In: Proceedings of 16th Conference Great Lakes Research, 1973, International Association for Great Lakes Research, Ann Arbor, Michigan, 1974. p 7-14, 3 fig, 3 tab, 21 ref. OWRT A-035-NY(3).

Descriptors: *Laboratory tests, *Phosphorus, *Limiting factors, *Nutrients, *Phytoplankton, *New York, Fluorescence, Photosynthesis, Algae, Biological communities.
Identifiers: *Cayuga Lake(NY), Turbidostats, Species composition, Chemostats.

In a continuous-flow culture, it is possible by manipulating supply rate and nutrients in the medium to subject populations to exactly controlled nutrient concentration and displacement rates. Moreover, its operation provides conditions that facilitate measurement of dynamic processes that are ordinarily difficult to determine, such as cell division rates, nutrient uptake rates or changes in species composition. Experiments are described in which samples of the natural phytoplankton community from Cayuga Lake, New York were maintained in chemostats using filtered lake water as a medium. When P-enriched lake water was supplied the added P was rapidly assimilated and the equilibrium population that resulted, although as much as ten-fold larger, was still P-limited and nearly unchanged in species composition. When, however, the same initial populations were maintained under P-sufficient conditions in a turbidostat, there were rapid changes in species composition, the populations eventually becoming dominated by small diatoms. These experiments thus suggest that most of the Cayuga Lake components of the summer phytoplankton community are P-limited and that relatively large changes in P would have to be made before other nutrients became limiting. (Jones-Wisconsin)
W75-04891

CHLOROPHYLL A DISTRIBUTION IN LAKE HURON AND ITS RELATIONSHIP TO PRIMARY PRODUCTIVITY,
Canada Centre for Inland Waters, Burlington (Ontario).
W. A. Glooschenko, J. E. Moore, and R. A. Vollenweider.
In: Proceedings 16th Conference Great Lakes Research, 1973, International Association Great Lakes Research, Ann Arbor, Michigan, 1974., p 40-49. 9 fig, 2 tab, 26 ref.

Descriptors: *Chlorophyll, *Distribution, *Lake Huron, *Primary productivity, Seasonal, Trophic level, Photosynthesis.
Identifiers: *Saginaw Bay(Lake Huron).

The spatial and temporal distribution of chlorophyll-a, primary production and assimilation number (production/chlorophyll ratio) in Lake Huron, including Saginaw Bay, were investigated. Water samples were collected from 46 stations on eight cruises between April and December 1971. Except for Saginaw Bay and U.S. inshore waters south of the bay mouth, chlorophyll-a values were quite low with maxima rarely exceeding 3 micrograms/1. The seasonal cycle of chlorophyll-a was weakly bimodal with maxima in mid-late spring and mid-autumn. The summer minimum was not pronounced. Sharp gradients of chlorophyll-a occurred in Saginaw Bay, where the highest chlorophyll-a values yet observed in the Great Lakes were noted. Between April and December, the mean chlorophyll-a value for the lake (excluding Saginaw Bay) was between 1 and 2 microgram/l, indicating extreme oligotrophy. Primary production measurements showed the same pattern as chlorophyll-a with highest values in Saginaw Bay. Integral photosynthesis values, mg/sq m/hr or year, were roughly half that of Lake Ontario. Assimilation numbers, mgC/mg chlorophyll-a hr were positively correlated with temperature. Highest numbers were in Saginaw Bay, indicating its enriched nutrient status. (Jones-Wisconsin)
W75-04892

ENVIRONMENTAL TESTING OF CITRATE: BIOASSAYS FOR ALGAL STIMULATION,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
A. G. Payne.
In: Proceedings 16th Conference Great Lakes Research, 1973 International Association Great Lakes Research, Ann Arbor, Michigan, 1974. p 100-115. 2 fig, 5 tab, 9 ref.

Descriptors: *Bioassay, *Algae, *Growth rates, *Sodium compounds, Detergents, Eutrophication, Sewage, *Lake Erie, *Lake Michigan, Standing crops, Biodegradation, Inhibitors, Chelation.
Identifiers: *Citrate, *Biostimulation, Selenastrum capricornutum, Microcystis aeruginosa, Cleveland(Ohio), Buffalo(NY), Chicago(Ill).

Sodium citrate has been under investigation by the industry as a possible detergent builder; it is currently being used in several liquid detergent brands. Possible effects of sodium citrate on eutrophication was investigated throughout an algal growing season using the Algal Assay Procedure Bottle Test on 17 locations, including Lakes Erie and Michigan. The algae selected for study were bacteria-associated Selenastrum capricornutum and Microcystis aeruginosa. Growth was followed by cell counts. Sewage generally stimulated algal growth to higher maximum standing crops than the control. Citrate added to sewage normally had no additional effect on algal maximum standing crops and no stimulation by addition of citrate along was detected in any water. Citrate added to sewage prevented die-off of Microcystis in four waters and citrated added without sewage treatment and at relatively high levels of 1 and 10 mg/l caused some growth inhibition of Selenastrum in seven waters. It is postulated that these effects were due to chelation of trace metals. Citrate added to sewage caused an increase in growth rate in eight situations and a decrease in growth rate in six situations. In most instances, the different growth rates caused no differences in maximum standing crops. (Jones-Wisconsin)
W75-04893

WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. W. Bulkley, and A. P. Mathews.
In: Proceedings 16th Conference Great Lakes Research, 1973, International Association Great Lakes Research, Ann Arbor, Michigan, 1974, p 872-889. 13 tab, 6 ref. NOAA 04-4-158-23.

Descriptors: *Water quality, *Great Lakes, *Institutions, *Data collections, *Surveys, Local governments, Water pollution sources, Waste treatment, State governments, Land use, Human population, Density, Land resources, Comprehensive planning.
Identifiers: Provincial agencies, Questionnaires.

A questionnaire survey conducted among 650 governmental units in the Great Lakes areas has identified the levels of water quality, the perceived factors contributing to the destruction of water resources, and possible solutions to deteriorating water quality. One-way frequency distributions obtained, based on 300 questionnaires, indicate that water quality perceived is medium or lower in 92% of the cases, while it is low or very low in 35%. Inadequate municipal sewage treatment and inadequate industrial effluent treatment was identified to be the most common factors causing the destruction of water resources. The primary agencies responsible for maintenance of water quality in the local areas were the state and provincial. Analysis of two-variable relationships have been made with a view to link the chain of causal factors influencing water quality in the Great Lakes; it is found to vary with the type of land use and population density, decreasing with both increasing degree of industrialization and with increasing population density. A causal sequence model in which population density appears as the intervening variable between land use and water quality is proposed and this seems to correlate with the data. (Jones-Wisconsin)
W75-04894

IMPACT OF DETERGENT PHOSPHATE REDUCTIONS ON WATER QUALITY,
State University Coll., Buffalo, N.Y. Great Lakes Lab.
R. A. Sweeney.
In: Proceedings 16th Conference Great Lakes Research, 1973, International Association of Great Lakes Research, Ann Arbor, Michigan, 1974, p 967-976. 6 fig, 1 tab, 11 ref. EPA 801229.

Descriptors: *Detergents, *Pollution abatement, *Phosphates, *Legislation, Water quality, Streams, Algae, Biomass, Biochemical oxygen demand, Nutrient removal, Sewage treatment, Eutrophication, *New York, On-site investigations.
Identifiers: *Erie County(NY).

Stream quality was measured at 164 stations on 28 major streams during June through August 1970-1972 in Erie County, New York. Twelve sites in remote regions served as controls. During this period, the phosphate content of detergents sold in the county was limited by legislative action to a maximum of 8.7% P as of April 30, 1971 and 0.5% P as of January 1, 1972. The ortho and total P content of the influent to and effluent from municipal sewage treatment plants decreased by 25% and 20%, respectively in 1971 and 55% and 45% in 1972. At the same time, the ortho and total phosphorus in the streams declined by 47% nad 33% in 1971 and 67% and 60% in 1972. Algal biomass decreased by 27% in 1971 and 55% by 1972. BOD improved by 20% ain 1971 and 27% in 1972. BOD only, increased by 90% in 1972 at the control locations. There was no major difference in rainfall or discharge between the study periods. Since no improvement in sewage treatment plants and collection systems occurred, it was concluded that the phosphate detergent limitation resulted in stream quality improvement and eutrophication abatement. (Jones-Wisconsin)
W75-04895

MICROBIOLOGICAL EXAMINATION OF LAKE ONTARIO SEDIMENTS: I. DISTRIBUTION OF AEROBIC AND ANAEROBIC HETEROTROPHS IN SEVERAL LAKE ONTARIO SEDIMENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. B. Bell, and B. J. Dutka.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 1-8. 3 fig, 4 tab, 9 ref.

Descriptors: *Bacteria, *Lake Ontario, *Sediments, *Distribution, *Organic matter, Aerobic conditions, Anaerobic conditions, Depth, Oxidation-reduction potential, Density, Cores, Correlation analysis.

Bacteriological studies on Lake Ontario deep water sediments were initiated to investigate distribution of aerobic and anaerobic heterotrophs and their relationships to organic matter. Relationship between Eh and bacterial densities was also investigated. Cores were collected in the Rochester, Mississauga and Niagara Basins from areas typical of deep water environment. The sampled areas each had fine silty clay mud accumulations and the highest organic carbon content in the basin. A fourth core was collected from a shallow silty clay mud location in the Kingston Basin, at the junction of the St. Lawrence River and Lake Ontario where the highest organic carbon content in Lake Ontario is found. Total heterotroph populations are proportional to organic matter present. Majority of sediment bacteria are facultative, as the obligate aerobes are eliminated by the reduced oxygen tension after the first few centimeters. Facultative bacteria, by utilizing available oxygen, affect Eh of sediment profile. The uniformity of bacterial densities, Eh and organic matter distribution throughout the samples cores suggests uniform conditions in the silty clay mud sediments

of the deep water basins in Lake Ontario. (See also W75-04897) (JonessWisconsin)
W75-04896

MICROBIOLOGICAL EXAMINATION OF LAKE ONTARIO SEDIMENTS: II. HETEROTROPH METHODOLOGY COMPARISON.
Canada Centre for Inland Waters, Burlington (Ontario).
J. B. Bell, and B. J. Dutka.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 9-14. 4 fig, 5 ref.

Descriptors: *Bacteria, *Lake Ontario, *Sediments, *Laboratory tests, Biomass, Distribution, Temperature, Analytical techniques, Cores, Aerobic conditions, Anaerobic conditions.
Identifiers: Spread plate technique, Membrane filtration technique, Mesophilic bacteria.

Heterotrophic bacterial densities in sediment samples collected from four basins in Lake Ontario were investigated by use of membrane filtration and spread plate techniques. Bacterial populations thus enumerated are directly influenced by the medium used, incubation temperature, incubation period, and oxygen concentrations. Densities obtained by membrane filtration and spread plate techniques were highly comparable. Aerobic densities were almost identical in the tested samples while anaerobic densities, although maintaining similar distribution patterns, showed greater disparity between test samples, and illustrated nonspecific technique dominance. Total bacterial populations, aerobic and anaerobic, were coincident at the sediment-water interface. The deeper the section of sediment tested for aerobic populations, the greater the difference between 4 and 20C. Anaerobic populations showed less 4-20 C variation, with the 20 C populations never exceeding the 4 C populations by more than one order of magnitude. Either there are equal populations of mesophiles and psychrophiles with very strict temperature requirements throughout the sediments or more probably the great majority of the anaerobic bacteria are mesophiles. Apparently there are very few if any true psychrophilic bacteria in Lake Ontario sediments. The spread plate technique was method of choice. (See also W75-04896) (Jones-Wisconsin)
W75-04897

EFFECT OF PAPER PLANT POLLUTION AND SUBSEQUENT ABATEMENT ON A LITTORAL MACROINVERTEBRATE COMMUNITY IN LAKE ONTARIO: PRELIMINARY SURVEY,
State Univ., Coll., Oswego, N.Y. Lake Ontario Environmental Lab.
J. G. Bocsor, and J. H. Judd.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 21-34. 2 fig, 2 tab, 30 ref. NOAA-SG-2-35281.

Descriptors: *Pulp wastes, *Water pollution effects, *Biological communities, *Cladophora, Abatement, Pulp and paper industry, Littoral, Invertebrates, *Lake Ontario, Seasonal, New York, Effluents, Amphipods, Diptera, Larvae, Oligochaetes, Gastropods, Systematics, Ecological distribution.
Identifiers: Biological diversity, Oswego(NY), Gammarus fasciatus, Hirudinea, Turbellaria, Trichoptera, Cricotopus, Naididae.

Biological parameters were used to determine the effects of seasonal changes in environmental conditions and the effects of pollution and its abatement on the structure and level of organization of the littoral invertebrate community in the immediate area of the Hammermill Paper Company, Oswego, New York on Lake Ontario. The diversity, meaning the relative number of species, will be a measure of the level of organization of that community. The community was composed of three major taxa: Amphipoda, represented only by Gammarus fasciatus, Diptera larvae, and Oligochaeta. Specimens of Gastropoda, Hirudianea, Turbellaria, and Trichoptera were also found but these were not abundant. In all, about 35 species were identified. It seems that the level of diversity has been depressed by the introduction of paper mill wastes over a long period. Comparisons were made between two stations nearest the effluent duct, and one at a distance of 150 m, using the index of Fisher et. al., to summarize community diversity. These showed that diversity was depressed by the effluent. An analysis of community structure was made using the log series distribution as a model. (Jones-Wisconsin)
W75-04898

THE DISTRIBUTION OF DIATOMS ON THE SUPERFICIAL SEDIMENTS OF LAKE ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
H. C. Duthie, and M. R. Sreenivasa.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 45-52. 2 fig, 2 tab, 9 ref.

Descriptors: *Spatial distribution, *Diatoms, *Lake sediments, *Lake Ontario, Plankton, Paleolimnology, Ecological distribution, Eutrophication, Littoral, Profundal zone.
Identifiers: Species diversity, Stephanodiscus hantzschii, Stephanodiscus astraea, Stephanodiscus tenuis, Tabellaria fenestrate, Melosira islandica, Melosira binderana, Fragilaria crotonensis, Cyclotella atomus, Achanthes haukiana, Achnanthes ovalis, Asterionella formosa.

Composition of sedimentary diatom flora, horizontal distribution of species, relations of the sedimentary diatom flora to that of plankton and any correlations with chemical or other environmental factors were determined. Over 100 diatom taxa were identified from samples of the top 3 cm of sediment at five inshore and six offshore stations in Lake Ontario. The diversity of the samples was generally low; highest values were found among the inshore samples. At the inshore stations, 38-57% of the individuals per sample were typical of eutrophic conditions with higher values off Toronto, Ontario and near Rochester, New York. The largest group of diatoms in all offshore samples except one were those classified as eurytopic-eutrophic and ranged from 50 to 64% of the total count. The exception was in the shallow northeastern basin where the eutrophic category was the largest. Diatoms typical of eutrophic conditions declined in a series of offshore samples from 29% in the extreme westerly sample to 1% in the deep southeastern basin. It may be concluded that the sediment diatom flora can be used with caution to interpret present and past ecological conditions in Lake Ontario. (Jones-Wisconsin)
W75-04899

DISTRIBUTION OF CHLOROPHYLL A AND RELATED VARIABLES IN ONTARIO WATERS OF LAKE ST. CLAIR,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
J. H. Leach.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 80-86. 5 fig, 1 tab, 12 ref.

Descriptors: *Distribution, *Chlorophyll, *Lakes, Nutrients, Eutrophication, Great Lakes, Currents(Water), Winds, Chemical properties, Agricultural runoff, Sewage effluents, Municipal wastes, Phytoplankton, Biomass, Silica, Lake Ontario.
Identifiers: *Lake St. Clair.

Information collected between April and November 1971 on distribution of chlorophyll-a and selected environmental variables in Ontario waters of Lake St. Clair are reported. Several drainage canals and small rivers enter the lake along the east and south shores draining a large area of agricultural land intensively cultivated. Effluents from several towns, villages, approximately 2000 cottages, and municipalities drain into the lake. Current structure, established by the flow of Lake Huron water through the delta system and wind direction, is the primary influence. Gradients in concentrations of chlorophyll and chemical variables increase from northwest to southeast. Because of nutrient inputs from agricultural drainage and sewage discharge and greater stability in water mass, the southeastern area is more eutrophic than the remainder of the Ontario section of the lake. The rate at which eutrophication increases in the remainder of the lake will depend largely on the quality of water entering through the St. Clair River. The nutrient demand in the southeastern area seems to be in excess of that required for phytoplankton biomass. In view of the shallowness of the lake it is likely that submerged aquatic plants and attached algae are competing for available nutrients. (Jones-Wisconsin)
W75-04900

METHANE PRODUCTION IN LAKE ERIE SEDIMENTS: TEMPERATURE AND SUBSTRATE EFFECTS,
Ohio State Univ., Columbus. Dept. of Microbiology.
G. E. Mallard, and J. I. Frea.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 87-93. 3 fig, 1 tab, 15 ref.

Descriptors: *Methane, *Sediments, *Temperature, Inhibition, Bacteria, *Lake Erie, Lake sediments.
Identifiers: Hydrogen gas, Methanol, Ethanol, Propanol, Butanol, Formate, Acetate, Propionate, Butyrate.

The effect of temperature and the addition of various compounds--hydrogen gas, methanol, ethanol, propanol, butanol, formate, acetate, propionate and butyrate--on the production of methane by organisms in sediment from Lake Erie were determined. Incubation temperature used were 10, 28, and 37 C. All cultures were grown in the laboratory. In the temperature studies, the sediment along was used as substrate. In the substrate studies, additional substrates were added aseptically to each bottle after gas addition and before the inoculum. More methane is produced at 37 C than at 28 C. No methane is produced at 10 C unless the culture is first primed by growth at higher temperatures. Methane production is enhanced by the addition of methanol, acetate, ethanol, propanol, butyrate and hydrogen gas. The addition of butanol, formate and propionate appears to inhibit normal methane production. All of these substrates would normally be found in the lake sediments. The concentrations of each compound would change seasonally as does the amount of total organics in the lake. It is clear that a variety of compounds are able to stimulate methane production. (Jones-Wisconsin)
W75-04901

BACTERIA-PHYTOPLANKTON RELATIONSHIPS IN LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
A. S. Menon, W. A. Glooschenko, and N. M. Burns.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 94-101. 5 fig, 19 ref.

Descriptors: *Bacteria, *Phytoplankton, *Lake Erie, *Seasonal, *Spatial distribution, Organic

matter, Density, Eutrophication, Mesotrophy, Stratification, Hypolimnion, Chlorophyll, Diatoms, Metabolism, Cycling nutrients.

Seasonal distribution of bacteria and phytoplankton at selected stations in Lake Erie was determined and type of relationships which exist between them during the period from late May to early December 1971 was established. Six stations were chosen to cover the three Lake Erie basins. The number of bacteria were determined on all samples by filtering 1-5 ml of water sample through a 0.45 micron membrane filter. The chlorophyll-a value was used as a measure of phytoplankton. A number of different, simple relationships existed between bacteria and phytoplankton, of which four different types were found in this study. Generally, bacteria appeared to be dependent on the nutrients derived from the excretion and degradation of phytoplankton. It appears that a large number of various factors determine which of the simple bacteria-phytoplankton-carbon relationships can exist at any one time. It is apparent from these findings that future research on the factors responsible for the different types of relationships between bacteria and phytoplankton will gain further insight into the metabolic cycle and the problem of eutrophication of the Great Lakes system. (Jones-Wisconsin)
W75-04902

BENTHIC MACROFAUNA IN THE COASTAL ZONE OF SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
S. C. Mozley, and L. C. Garcia.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 102-116. 3 fig, 4 tab, 30 ref.

Descriptors: *Benthic fauna, *Coasts, *Lake Michigan, Nuclear powerplants, Biological communities, Great Lakes, Depth, Diptera, Oligochaetes, Sediments, Indicators, Baseline studies, Environmental gradient, Spatial distribution, *Michigan.
Identifiers: *Benton Harbor(Mich), Species diversity, Pontoporeia effinis, Sphaerium striatinum, Limnodrilus hoffmeisteri, Stylodrilus heringianus, Sphaerium, Pisidium.

Area around a large atomic power plant, on the shore of Lake Michigan, was studied to assess the inshore water quality and biological communities near the plant before it begins operation. In July 1970, the first of a continuing series of benthos surveys was conducted in southeastern Lake Michigan in an area centered 16 km south of Benton Harbor, to determine benthic species composition and abundance. Application of a standard species diversity index to the samples gave moderate to high values, indicating good quality of benthic environment. Where low values occurred, they were attributable to the severity of the natural environment rather than pollution. A preliminary hypothesis indicates that a zonation of the benthic environment is a general feature of exposed coastal zones in the Great Lakes and this zonation is reflected in both total numbers and species composition of the benthic fauna. The most important factors in this zonation are water movements and their control of sedimentation processes. Thermal stratification and variation may have supplementary effects on species compositions. In spite of general eutrophication in southern Lake Michigan, the benthic community is relatively diverse and well balanced. (Jones-Wisconsin)
W75-04903

NUTRIENT DISCHARGES TO GREEN BAY, LAKE MICHIGAN FROM THE LOWER FOX RIVER,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
P. E. Sager, and J. H. Wiersma.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 132-148.

Descriptors: *Eutrophication, *Organic matter, *Nutrients, *Discharge(Water), *Lake Michigan, Municipal wastes, Ammonia, Seasonal, Phosphorus, Anaerobic conditions, Nitrates, Chemical oxygen demand, Chlorophyll, Phosphates, Waste assimilative capacity, Nitrogen, Biochemical oxygen demand, *Wisconsin.
Identifiers: *Green Bay(Lake Michigan), *Fox River(Wis), Lake Winnebago(Wis).

The annual variation in nutrient discharges to Green Bay from the Fox River was determined and the relative importance of nutrient inputs to the Fox River from municipal sources and from Lake Winnebago assessed. To assess the downstream variation in nutrient concentrations and algal abundance, ten sampling stations were set up in a grid pattern over the lower bay, extending out 9.5 miles. Seasonal variations in discharge of nutrients and organic matter from the Fox River to Green Bay were related to the quality of Lake Winnebago discharges and to processes of assimilation, sedimentation and release in the river. Lake Winnebago's effects on the river included increased levels of ammonia-nitrogen in spring, total phosphate in summer and orthophosphate in fall. Anoxic conditions in portions of the river indicated excessive organic loading. Maximum loadings of phosphates and organics during winter and spring reflected high flows, reduced assimilation and releases from the drainage system. As a nutrient source for lower Green Bay, Lake Winnebago contributes nitrogen and phosphorus compounds to lower Fox River in excess of or approximately equal to that contributed by municipal treatment plants. (Jones-Wisconsin)
W75-04904

NUTRIENT ENRICHMENT AND ITS EFFECT ON PHYTOPLANKTON PRODUCTION AND SPECIES COMPOSITION IN LAKE SUPERIOR,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, L. E. Feldt, M. A. Santiago, and E. F. Stoermer.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 149-165. 4 fig, 6 tab, 15 ref. AEC CO0-2003-13.

Descriptors: *Nutrients, *Phytoplankton, *Productivity, *Lake Superior, Phosphorus, *Eutrophication, Silica, Trace elements, Vitamins, Chlorophyll, Photosynthesis, Nitrogen, Biological communities, On-site tests, Limiting factors.
Identifiers: *Species composition, Cyclotella glomerata, Cyclotella stelligera, Cyclotella comensis, Species diversity.

Whether phosphorus is a limiting nutrient in Lake Superior and whether other nutrients would increase phytoplankton growth and productivity were determined. The study was divided into two phases: measurement of environmental parameters at a number of lake stations and a series of nutrient enrichment experiments, conducted at Station 11. Nutrient enrichment experiments were conducted by adding nutrients to lake water with natural phytoplankton assemblages contained in plastic bags in Lake Superior during August 1971. Additions of small concentrations of phosphorus (7.5 micrograms/l) stimulated phytoplankton growth threefold and fivefold by addition of 30 micrograms P/l, plus silica, trace metals, vitamins and EDTA. Predicted effects of nutrient enrichment based on phosphorus alone will be very conservative. These data indicate that phosphorus, when combined with small quantities of trace metals, vitamins and chelating agent, has a greater effect on phytoplankton growth than phosphorus alone. Concentrations of chlorophyll and carbon fixation rates also increased in the treatment--one containing phosphorus and one containing phosphorus, silica and nitrogen. Phytoplankton assemblages in the experiments were dominated by three Cyclotella species--C. glomerata, C. stelligera and C. comensis. The data indicate that the experimental results would have been representative of the entire study area. (Jones-Wisconsin)
W75-04905

CHEMICAL CONTROL OF AQUATIC WEEDS AND ITS EFFECT ON THE NUTRIENT AND REDOX STATUS OF WATER AND SEDIMENT,
Wisconsin Univ., Madison. Dept. of Soil Science.
G. V. Simsiman, G. Chesters, and T. C. Daniel.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 166-180. 6 fig, 31 ref.

Descriptors: *Chemcontrol, *Aquatic weed control, *Nutrients, *Oxidation-reduction potential, Sediments, Herbicides, Diquat, Anaerobic conditions, *Wisconsin, Oxygenation, Phosphates, Sulfur, Decomposing organic matter, Nitrogen, Phosphorus, Dissolved oxygen, Ammonia, Laboratory tests, Eutrophication.
Identifiers: Endothall, Watermilfoil, Elodea, *Lake Mendota(Wis).

Observation of the effect of weedkill on the growth of algal blooms, nutrients, and redox status are described. The experiment was conducted in simulated sediment-water systems in a temperature controlled plant growth room provided with fluorescent and incandescent light and well ventilated. Sediment and water were obtained from Lake Mendota, Madison, Wisconsin. After a matted growth of watermilfoil (Myriophyllum spicatum) and Elodea (Elodea canadensis) were established and guppies introduced, herbicidal treatments were made, namely: control, diquat (1.5 ppm), endothall (3.0 ppm), combination of diquat (0.375 ppm) and endothall (0.75 ppm) and a combination of diquat (0.75 ppm) and endothall (1.5 ppm). Anoxic conditions developed earlier in the diquat- and combination treated sediment-water systems than in the endothall-treated systems. Reduction process and anoxia occurred concomitantly. Anoxia was followed by rapid reoxygenation because of algal blooms. Accumulation of dissolved orthophosphate-P and sulfur occurred during weed decompostion but only trace amounts of ammonia-nitrogen were found. Inorganic N and F released from the decomposing weeds were readily available for algal assimilation and/or sorption by the sediment. Diquat alone or in combination with endothall caused more rapid weedkill, thereby promoting more drastic changes in the aquatic environment than endothall alone. (Jones-Wisconsin)
W75-04906

BACTERIAL AND PHYSICAL CHARACTERISTICS OF LAKE ONTARIO SEDIMENT DURING SEVERAL MONTHS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. M. Vanderpost.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 198-213. 7 fig, 12 tab, 36 ref.

Descriptors: *Sediments, *Bacteria, *Physical properties, *Lake Ontario, Cores, Aerobic bacteria, Anaerobic bacteria, Sulfur bacteria, Sedimentology, Nitrogen fixation, Dating, Nitrogen, Carbon, Organic matter, Carbonates, Hydrogen ion concentration, Oxidation-reduction potential, Sands, Silts, Clays, Sedimentation rates, Depth, Color, Seasonal, *Lake sediments.

Beginning in July 1971 and continuing through February 1972, sediment cores were obtained monthly at one station in Lake Ontario in an attempt to demonstrate whether seasonal ariations occurred in heterotrophic bacterial total counts ad several bacterial biotype distributions in Lake Ontario sediments. Six core subsections were analyzed for total aerobic and anaerobic heterotrophic bacteria, sulfur-oxidizing, sulfate-reducing, ammonifying, nitrogen-fixing denitrifying, and putrefactive bacteria. Total nitrogen, total carbon, organic carbon, organic matter, carbonate carbon, pH, Eh, the Ambrosia horizon and sand, silt and clay percentages were measured. Color was noted. Eh became less negative down to 12 cm deep after the fall overturn in October. Numbers of bacteria and percentages of organic carbon and water decreased logarithmically in the sediment. The bacterial populations related directly to organic carbon and were slightly affected by Eh. The results indicate that these bacteria do not exhibit seasonal population variations. Recent investigations indicate that the rate of sedimentation of organic carbon is fairly uniform over the whole of the main basin of Lake Ontario providing an explanation for the apparent lack of seasonal varition in these sedimentary bacterial populations. (Jones-Wisconsin)
W75-04908

VARIATIONS IN THE PHYSICO-CHEMICAL PROPERTIES OF LAKE SUPERIOR,
National Ocean Survey, Detroit, Mich. Lake Survey Center.
C. E. Adams, Jr.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 221-236. 10 fig, 2 tab, 16 ref.

Descriptors: *Physicochemical properties, *Lake Superior, *Distribution, Alkalinity, Conductivity, Hydrogen ion concentration, Calcium, Chemical properties, Seasonal, Sodium, Dissolved solids, Silica, Optical properties.

Temporal and spatial distributions of physicochemical properties of Lake Superior and its immediate environment were investigated and interrelationships between those properties and the physical, chemical and biological controls determined. Several water samples were collected at standard depths except for stations with water depths less than 20 m, where surface, middepth and near bottom samples were taken. Comparison of present chemical data, based on analyses of more than 5000 samples collected in 1968-1969, with previous data indicated little or no increase in dissolved constitutents in Lake Superior. Slight increases of alkalinity and specific conductance from 1968-1969 suggested that slight gradients in those parameters existed between eastern and western basins. Local, intense increased of alkalinity, sodium and specific conductance at the lake's western end for short periods of time caused measurable buildups of dissolved materials and had a direct influence on the long term accumulation of dissolved solids. Curves of annual distributions indicate that alkalinity, pH and calcium progress through definite seasonal cycles. The relationship of those variations to the thermal cycle is shown. The distributions should provide a systematically developed base for evaluating cultural influence on Lake Superior and other similar aquatic systems. (Jones-Wisconsin)
W75-04909

TRACE ELEMENT DETERMINATIONS ON LAKE MICHIGAN TRIBUTARY WATER SAMPLES USING SPARK SOURCE MASS SPECTROMETRY.
Argonne National Lab., Ill.
M. A. Wahlgren, D. N. Edgington, F. F. Rawlings, and J. L. Rawls.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 298-305. 3 fig, 6 tab, 8 ref.

Descriptors: *Trace elements, *Lake Michigan, *Tributaries, *Analytical techniques, Spectrometers, Technology, Spectroscopy, *Pollutant identification.
Identifiers: *Spark source mass spectrometry.

Emission and absorption spectroscopy are used for trace element surveys of natural waters. Emission spectroscopy is a multielement analysis but lacks sensitivity and is subject to matrix interferences. The spark source mass spectrometer offers the potential of high and fairly uniform sensitivities for almost all chemical elements in a single multielement analysis. Although electrically conductive metallic samples are better suited for the instrument, techniques have been developed to make conducting electrodes from biological and geological specimens by mixing with graphite powder. To evaluate the applicability of this method, a set of 22 samples from tributaries to the South Basin and Green Bay regions and from a nearshore Lake Michigan region have been analyzed for 37 selected trace elements of radiological, biological and geochemical interest. Consideration of elements of the periodic table indicates potential for determining concentrations of upper limits for approximately 60 elements in a single sample. To accomplish this, the instrument would require higher resolution than currently attained with RF source sparking and the addition of automated plate scanning facilities. With automated plate scanning and a more comprehensive computer program, it is possible to better utilize the interelement and matrix interference information recorded on the photographic plate. (Jones-Wisconsin)
W75-04910

REGIONAL CHARACTERIZATIONS OF THE THERMAL PROPERTIES OF LAKE ONTARIO,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 2H.
W75-04911

DELINEATION OF GREAT LAKES ESTUARIES,
Ohio River Valley Sanitation Commission, Cincinnati.
For primary bibliographic entry see Field 2H.
W75-04912

RECREATIONAL USES OF GREEN BAY: BAY/NON-BAY USERS COMPARED,
Wisconsin Univ., Green Bay. Leisure Sciences Collateral.
For primary bibliographic entry see Field 6B.
W75-04913

FACTORS AFFECTING POTENTIAL EVAPOTRANSPIRATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2D.
W75-04916

SNOW INTERCEPTION AND REDISTRIBUTION IN THE FOREST,
Forest Service(USDA), Fort Collins, Colo., Rocky Mountain Forest and Range Experimental Station.
For primary bibliographic entry see Field 2C.
W75-04917

CLUSTER ANALYSIS AND DIVERSITY IN RECOVERY OF DAMAGED STREAMS,
Kansas Water Resources Research Inst., Manhattan.
R. L. Kaesler.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 792, $4.75 in paper copy, $2.25 in microfiche. Contribution No 141. September 1974. 77 p, 27 fig, 10 tab, 41 ref.

Descriptors: Streams, Virginia, Tennessee, Rivers, *Biota, Distribution patterns, Potomac River, *Correlation analysis, Water pollution effects, Path of pollutants.
Identifiers: *Cluster analysis, *Clinch River(Va-Tenn), Stream recovery, Dendrograms.

Methods of agglomerative cluster analysis were applied to data from surveys of the Clinch River in Virginia and Tennessee taken after devastating industrial spills and floods. Results of the cluster analysis agreed closely with results of analysis of diversity and density. Moreover, cluster analysis was particularly useful in detecting the effects of type of substrate, time of sampling, longitudinal succession, and especially flooding. Data on the distribution of the biota of streams may be unnecessarily expensive and time-consuming to collect because of redundancy of information provided by various groups of organisms. Using correlation coefficients computed between corresponding elements of Q-mode similarity matrices, it was found that in the upper Potomac River aquatic insects gave the best agreement with the total biota of any subset tested ($r = 0.603$). In the Clinch River, similarities among stations based on occurrences of Ephemeroptera and Coleoptera agreed most closely with similarities based on the total insect fauna, but the two orders were not closely similar to each other. This result suggests that study of both groups may reveal most of the information provided by the total insect fauna. Associations among stations based on occurrences of Gastropoda were closely similar to those based on the total noninsect macroinvertebrate fauna.
W75-04934

BIOCHEMISTRY OF ESTUARINE ECOSYSTEM WITH EMPHASIS ON HEAVY METALS AND SHELLFISH,
Maryland Univ., College Park. Dept. of Chemistry.
M. Keeney.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 793, $3.25 in paper copy, $2.25 in microfiche. Maryland Water Resource Research Center, College Park, Technical Report No 28, December 1974. 9 p, 2 fig, 4 ref. OWRT B-017-Md(1), 14-31-000-3894.

Descriptors: *Oysters, *Enzymes, *Metabolism, *Carbohydrates, *Nutrient requirements, *Heavy metals, Biochemistry, Absorption, Aquatic animals, Shellfish, Water pollution effects.
Identifiers: Malate dehydrogenase, Glucose, B-glucuronidase, Oyster shell fistula.

The main purpose was to obtain basic information on the biochemistry of estuarine animals in order to understand the mechanism and effects of heavy metal uptake on these animals. Two Ph.D. theses connected with this project have been completed and the abstracts of the theses are included. One was concerned with characterization of malate dehydrogenase in the oyster. This is a key enzyme in glucose metabolism. Glucose is the major energy pool in the oyster via glycogen storage in the winter and then utilization during the warm weather spawning season. The other thesis reported the occurrence and partial purification of B-glucuronidase in the oyster. A paper on the formation of a fistula in the oyster shell as a tool to study oyster metabolism and nutrition has been published. The manuscript is included as part of this report.
W75-04935

NITROGEN, PHOSPHORUS AND EUTROPHICATION IN THE FINGER LAKES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

R. T. Oglesby, W. R. Schaffner, and E. L. Mills.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 780, $3.75 in paper copy, $2.25 in microfiche. Technical Report No 94, January 1975. 27 p, 3 tabs, 14 fig, 19 ref. OWRT B-038-NY(1), 14-31-0001-4109.

Descriptors: *Water quality, *Lakes, *Eutrophication, *Phosphorus, *Phytoplankton, *Standing crops, *Chlorophyll, Limnology, Land use, Data collections, Nutrients, Summer, Winter, Seasonal, Runoff, Human population, Dissolved oxygen, Hydrology, Estimating, Management, Simulation analysis, Mathematical models, *New York.
Identifiers: *Finger Lakes(N.Y.), Sampling, Water transparency, Linear regressions, Loadings, Confidence intervals, Parabolic functions.

Phosphorus has been identified as that element exerting primary control over summer phytoplankton standing crops in New York's Finger Lakes. A model relating the specific loading (Lsp) of 'biologically available' phosphorus to winter total P concentrations, the latter to mean summer chlorophyll integrated for the upper 10 m of the water column and Lsp to summer chlorophyll has been developed for the Finger Lakes based on limnological, demographic and land use data compiled during 1972-73. The relationships were all well described by linear regressions and confidence intervals about the lines are given. The dependence of transparency (Secchi disc) on chlorophyll concentrations in the upper 10 m formed a parabolic (log-log) function.
W75-04936

SOME FACTORS AFFECTING THE DISTRIBUTION OF CRENOBIA ALPINA (DANA), POLYCELIS FELINA (DALYELL) AND PHAGOCATA VITTA (DUGES) (PLATYHELMINTHES) IN CAERNARVONSHIRE, NORTH WALES,
Reading Univ. (England). Dept. of Zoology.
J. F. Wright.
Freshwater Biol Vol 4, No 1, p 31-59. 1974. Illus.
Identifiers: Calcium, Crenobia-alpina, *Distribution, Food, Oxygen, Phagocata-vitta, *Platyhelminthes, Polycelis-felina, *United Kingdom(Wales), *Water temperature, Hydrogen ion concentration.

The distribution of C. alpina, Polycelis felina and Phagocata vitta was examined in 5 streams in North Wales (United Kingdom). The significance of Ca content and pH of the water was assessed from a survey of 93 streams, and limited observations on the O2 content of a stream were also made. Laboratory experiments involving tolerance to high temperature and current velocity were carried out on each of the 3 spp. and the results were used in the interpretation of the field data. P. vitta appeared to be confined to cool water of low Ca content (less than or equal to 14.4 mg/l) in North Wales, despite its ability to live and reproduce in hard water under laboratory conditions. C. alpina was shown to be capable of living permanently in cool springs with a gradient of 50% while Polycelis felina was limited to gradients of 27% or less in the streams investigated. In 2 of the streams examined in detail, where populations of C. alpina and P. felina were very important components of the fauna, species composition fluctuated dramatically alongside rapid changes in stream gradient. C. alpina was dominant over P. felina on the steeper gradients while P. felina became the dominant species on gradients in the region of 16% and less in circumstances where the temperature regime could not have been the limiting factor for C. alpina. Interspecific competition appears to be an attractive hypothesis to explain the dominance of P. felina over C. alpina at low gradients in streams where high temperature is not limiting to either species.--Copyright 1974, Biological Abstracts, Inc.
W75-04980

AN IMPROVED CHEMICAL DELIVERY APPARATUS FOR USE IN INTERMITTENT-FLOW BIOASSAYS,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W75-04994

BIOLOGICAL ASSESSMENT OF DIESEL SPILL IN THE VICINITY OF ANACORTES, WASHINGTON, MAY 1971,
Texas Instruments, Inc., Dallas.
J. A. Watson, J. P. Smith, L. C. Ehrsam, Jr., R. H. Parker, and C. J. Blanton.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-228 118, $7.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Office of Oil and Hazardous Materials, Washington, D.C., August 31, 1971. 200 p, 36 fig, 16 tab, 68 ref, 3 append. EPA Contract 68-01-0017.

Descriptors: *Oil spills, *Oil pollution, *Benthos, *Environmental effects, *Biological communities, Water pollution sources, Water pollution effects, Disasters, Oil wastes, Gas chromatography, Analytical techniques, Chemical analyses, Publications, Sampling, Sediments, Microorganisms, Bioassay, Laboratory tests, On-site data collections, Water analysis, *Pollutant identification.
Identifiers: *Anacortes(Wash), *Diesel oil, Shore traverse.

A survey to assess the biological damage resulting from the 26 April 1971 diesel spill at Anacortes, Washington, was conducted between 9 May and 12 May 1971. A total of 19 traverses was occupied on Guemes, Huckleberry, Saddlebag, Hat, Orcas, and Lummi Islands and Padilla Bay. Analyses of samples of hydrocarbon content using gas chromatography clearly indicate diesel contamination of sediments and water in the high-impact areas. The evidences for environmental damage are both visual (oozing of oil from intertidal sediments) as revealed by photographs and verbal documentation and circumstantial as revealed by the detailed analysis of the faunal data collected during this study. Several common intertidal invertebrates (chitons, limpets, large and small pelecypods, and large gastropods) and one fish (the common stickleback) were completely absent from the high-impact areas, although they were often collected or observed in 1958 and 1966 in the same region and locally reported to be common before the spill. The control area on Orcas Island, was the richest of all regions sampled. Diversity indices illustrated that the lowest diversities were obtained from the areas of largest visible amounts of oil. (Katz)
W75-05001

ESTIMATION OF HEAVY METAL POLLUTION IN TWO NORWEGIAN FJORD AREAS BY ANALYSIS OF THE BROWN ALGA ASCOPHYLLUM NODOSUM,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
For primary bibliographic entry see Field 5A.
W75-05002

PESTICIDE EFFECTS OF FISHES AND BIRDS IN RICE FIELDS OF SURINAM, SOUTH AMERICA,
Canadian Wildlife Service, Edmonton (Alberta).
K. Vermeer, R. W. Risebrough, A. L. Spaans, and L. M. Reynolds.
Environmental Pollution, Vol 7, No 3, p 217-236, November 1974. 2 fig, 16 tab, 19 ref.

Descriptors: *Fishkill, *Pesticides, *Snails, *Pest control, *Birds, *Rice, Path of pollutants, Mortality, Endrin, Organic pesticides, Methanol, Pollutant identification, Analytical techniques, South America, Water pollution effects.
Identifiers: *Surinam, Egrets, Herons, Jacanas, Snail kites, Sodium pentachlorophenol, Rice culture.

The effects of pesticides on fishes and birds in rice fields of Surinam were investigated from October to December 1971. Large fish kills were observed after the spraying of NaPCP for the purpose of reducing the populations of Pomacea snails. Fifty snail kites which feed exclusively on these snails were found dead after extensive application of NaPCP, and high pentachlorophenol residues were found in tissues of 17 of those that were analysed. Egrets, herons and jacanas were found sick or dead during the period of pesticide application. The levels of pentachlorophenol and endrin in these birds suggested that ingestion of contaminated food was a probable cause of the sickness and mortality observed. (Katz)
W75-05003

SOME ASPECTS OF THE TOXICITY OF P,P'-DDT, P,P'-DDE AND P,P'-DDD TO THE FRESHWATER PLANARIA, POLYCELIS FELINA (TRICLADIDA),
Hull Univ. (England). Dept. of Zoology.
H. H. Kouyoumjian, and R. F. Uglow.
Environmental Pollution, Vol 7, No 2, p 103-109, September 1974. 1 fig, 2 tab, 13 ref.

Descriptors: *DDD, *DDE, *DDT, *Chlorinated hydrocarbon pesticides, Aquatic animals, *Bioassay, *Pesticide residues, Lethal limit, Environmental effects, Water pollution effects, *Toxicity.
Identifiers: *Planaria(Polycelis felina).

The effects of p,p'DDT,p,p'-DDE and p,p'-DDD on the freshwater Triclad, Polycelis felina, were studied. The 96 h LC50 of the three chemicals were 1.05, 1.23 and 0.74 ppm, respectively. The chemicals appeared to exert their effects through the nervous system as revealed by the loss of coordinated movement and the retardation of the flip-over times of treated animals. DDT also tended to inhibit asexual fission at concentrations much lower than the observed 96 h LC 50. The carrier solvent acetone had no permanent effect on the gross behavior of the animals. P. felina responded consistently to experimental treatment and the observed intraspecific variation in the resistance to organochlorine chemicals, by animals of approximately the same size, was low. The use of this and other species of flatworms as bioassays of organochlorine chemicals is discussed. (Katz)
W75-05004

IMPACT OF PESTICIDES ON PHYTOPLANKTON IN EVERGLADES ESTUARIES,
Florida State Univ., Tallahassee.
S. A. Moore, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 618, $4.75 in paper copy, $2.25 in microfiche. South Florida Environmental Project: Ecological Report No. DI-SFEP-74 - 15, March, 1973. 92 p, 14 fig, 17 tab, 156 ref.

Descriptors: *Chlorinated hydrocarbon, Pesticides, *Dieldrin, *Aroclor, *DDT, *Bioassay, *Phytotoxicity, *Phytoplankton, *Polychlorinated biphenyls, Toxicity, Biochemistry, Water quality control, Nannoplankton, Estuaries, Methodology, Tracers, Radioisotopes.
Identifiers: *Everglades.

6-hour and 24-hour bioassays were conducted to determine the effect of selected organochlorine compounds on natural communities of estuarine phytoplankton. The effect of organochlorine concentration was a reduction of utilization of bicarbonate by the phytoplankton thereby reducing the photosynthetic production of organic materials. PCB phytotoxicity occurred at levels less than 5 micro g PCB/liter. DDT phytotoxicity first occurred at concentrations of 10 micro g DDT/liter.

Phytotoxicity of dieldrin is inconclusive with contradictory results. Nannoplankton and netplankton difference in Aroclor 1242 sensitivity was observed. Biochemical modes for organochlorine action are discussed in conjunction with difficulties in interpreting the effects of organochlorine compounds to phytoplankton. An objection to basing water quality standards on organochlorine concentrations is raised. (Katz)
W75-05005

ORGANOCHLORINE RESIDUES IN BROWN PELICAN EGGS: RELATION TO REPRODUCTIVE SUCCESS,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
L. J. Blus, B. S. Neely, Jr., A. A. Belisle, and R. H. Prouty.
Environmental Pollution, Vol 7, No 2, p 81-91, September 1974. 3 tab, 2 fig, 27 ref.

Descriptors: *DDE, *Dieldrin, Birds, *Bird eggs, *Environmental effects, *Reproduction, Chlorinated hydrocarbon pesticides, Organic pesticides, Hatching, Nests, Gas chromatography, Pollutants, *Pesticide residues, Pollutant identification.
Identifiers: *Brown Pelican, Nest success.

To determine the influence of residues of organochlorine pollutants on reproductive success in the brown pelican, sample eggs were taken from 93 nests and analysed for residues. Nest success was recorded and related to residues of DDE and dieldrin in sample eggs from the same nests. DDE seemed primarily responsible for nest failure but couldn't be satisfactorily separated from the deleterious effects of dieldrin. Maximum DDE residues in eggs from a successful nest were 2.37 micro g/g, and 8.48 micro g/g from an unsuccessful nest. Maximum values for dieldrin were 0.54 micro g/g and 0.99 micro g/g respectively. Residues of DDD, DDT or PCBs in sample eggs were not significantly related to nest success. (Katz)
W75-05006

EFFECTS OF INCREASING TEMPERATURE ON SOCIAL BEHAVIOUR IN GROUPS OF YELLOW BULLHEADS (ICTALURUS NATALIS),
Woods Hole Oceanographic Institution, Mass.
W. O. McLarney, D. G. Engstrom, and J. H. Todd.
Environmental Pollution, Vol 7, No 3, p 111-119, September 1974. 3 fig, 4 tab, 13 ref.

Descriptors: *Bullheads, Behaviour, *Heated water, *Temperature, *Thermal pollution, Laboratory tests, Water pollution effects, *Fish behaviour, Ecosystems.
Identifiers: *Aggressive behaviour(Fish).

Groups of two yellow bullheads (Ictalurus natalis), a socially complex fish, were kept in 50-gallon aquaria and subjected to 1C temperature increments every other day, over the range 24-33C. Total activity, and with it the incidence of aggressive behavior, increased with temperature over the entire range, with one notable exception. At about 30C activity decreased to a level below that observed at the lowest temperature studied. The mode, as well as the frequency, of aggressive behavior changed with temperature. Aggressive behavior units were divided into two categories - display or warning units, which do not result in injury to either fish, and damaging units which frequently do cause injury. Starting at 30C, the relative frequency of damaging units became much greater. It is suggested that this change in behavior is due to the loss of ability by yellow bullheads at high temperatures to distinguish individuals of their own species. A possible implication of this sort of phenomenon in natural ecosystems is discussed. (Katz)
W75-05007

OCCURRENCE OF DDT AND PCB COMPOUNDS IN BALTIC HERRING AND PIKE FROM THE TURKU ARCHIPELAGO,
Turku Univ. (Finland). Inst. of Biochemistry.
R. R. Linko, J. Kaitaranta, P. Rantamaki, and L. Eronen.
Environmental Pollution, Vol 7, No 3, p 193-207, November 1974. 3 tab, 2 fig, 23 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, DDD, DDE pesticides, Analytical techniques, Herrings, Pesticides, Pesticide residues, Pikes, Methodology, Pollutant identification.
Identifiers: *Tissue analysis, Clupea harengus, Esox lueius, *Bioaccumulation, *Baltic Sea(Gulf of Bothnia).

The contamination of Baltic herring and pike from six different areas of the Turku archipelago (the southwestern coast of Finland) with DDT and its metabolites DDE and DDD, and PCBs was studied. Herring muscle contained an average 0.38 ppm DDT compounds and 0.31 ppm PCBs on a fresh tissue basis. However, the values obtained for individual fish specimens showed large variations, depending mainly on the differences in the fat content of the fish. The range of DDT and PCB concentrations in herring from the Turku archipelago was similar to that found in herring from the Gulf of Bothnia. Pike muscle contained on average only 0.04 ppm DDT compounds and 0.05 ppm PCBs on a fresh tissue basis. The results show local differences in the residue concentrations of the fish. The chlorinated hydrocarbons were found to accumulate in the liver and ovary of the pike and, to a lesser degree, in the testis and kidney. In the ovary fat the DDT compounds concentration rose to 100 ppm and that of PCBs to 190 ppm. (Katz)
W75-05008

AN ATTEMPT AT EVALUATING THE STABILITY OF AN AQUATIC ECOSYSTEM,
Moscow State Univ. (USSR).
V. D. Fedorov, and S. A. Sokolova.
Hydrobiological Journal, No 2, p 6-8, 1973. 1 tab, 8 ref.

Descriptors: *Stability, *Aquatic environment, *Statistical models, Water properties, *Mathematical studies, *Evaluation, *Ecosystems, Plankton, Environmental effects.
Identifiers: *White Sea(Karelia), USSR.

The stability of the ecosystem off the Karelian Coast of the White Sea was estimated mathematically. The estimate describes the limiting behavior of the system and indicates the cause and effect relations existing between its components. 'Stability' of a system rests on the ability of a system to keep constant over time the characteristics that reflect the nature of its structural and functional organization. (Katz)
W75-05009

EFFECT OF TEMPERATURE AND TROPHIC CONDITIONS ON THE DURATION OF CLADOCERA DEVELOPMENT,
Belorussian State Univ., Minsk(USSR).
N. M. Kryuchkova.
Hydrobiological Journal, No 2, p 39-47, 1973. 3 fig, 2 tab, 37 ref.

Descriptors: *Growth rate, *Temperature, *Mathematical models, *Daphnia, Water pollution effects, Productivity, Zooplankton, Metabolism, *Crustaceans, Growth stages, Embryonic growth stage, Environmental effects, Statistical models.
Identifiers: *Krog's 'Normal Curve'.

The rate of embryonic and postembryonic development of Cladocera at different temperatures is approximated by Krog's 'normal curve'. The forage conditions of the female have no effect on the duration of the embryonic development of the crustaceans and only a slight effect on the duration of their postembryonic development. (Katz)
W75-05010

ETIOLOGY OF THE HAFF (YUKSOV-SARTLAN) DISEASE,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
T. I. Birger, A. Ya. Malyarevskaya, and O. M. Arsan.
Hydrobiological Journal, No 2, p 71-80, 1973. 2 tab, 102 ref.

Descriptors: *Toxicity, *Fishkill, *Fish diseases, *Cyanophtya, *Toxins, Water pollution effects, Diseases, Animal pathology, Algae, Eutrophication, Public health, Human diseases, Epidemics, Path of Pollutants, Biochemistry, Pollutant identification.
Identifiers: *Haff disease, *B1-Avitaminosis, *Thiaminase.

The etiology of the Haff disease is discussed, as it appears in affected fish as well as in consumers of diseased fish. The disease in humans occurs as a result of eating toxic fish which apparently come from waters with high concentrations of blue green algae. A suggested mechanism of action is that high levels of thiaminase from ingestion of blue-green algae lead to B1-avitaminosis and death in fish. Toxins from the algae accumulate in the fatty portions of the fish which are consumed by humans and lead to the disease. (Katz)
W75-05011

A REVIEW OF SOME EFFECTS OF CONTAMINANTS ON MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, Wash. Pacific Fishery Products Technology Center.
M. A. Steinberg.
In: Indo-Pacific Fisheries Council Proceedings, 15 th Session, Wellington, New Zealand, October 18-27, 1972. Section II: Coastal Aquaculture and Environment, Bangkok, 1974. p 8-23, 83 ref.

Descriptors: *Pesticides, Pollutants, *Polychlorinated biphenyls, Aquatic life, *Environmental effects, *Heavy metals, *Toxicity, Publications, *Water pollution effects, Mode of action, Aquaculture, Detergents, Dissolved oxygen, Mercury, Lead, Copper, DDT, *Reviews.
Identifiers: Synergistic effects, Sub-lethal doses, Coal tar, Bioaccumulation, Literature.

The effects of some pesticides, PCBs, heavy metals, solids and petroleum products on aquatic organisms are reviewed. The need to understand the mode of action of these toxicants on biological systems as well as the possible synergistic effects of pollutants on single species and entire ecosystems is stressed. The significance of exposure to sub-lethal doses of pollutants in respect to the safe-guarding of aquatic resources is considered and the development of proper experimental design in this field of research is discussed. (Katz)
W75-05012

WATER POLLUTION AS A CONSTRAINT TO THE DEVELOPMENT OF MARINE FARMING,
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
M. Fujiya.
In: Indo-Pacific Fisheries Council Proceedings, 15th Session, Wellington, New Zealand, October 18-27, 1972. Section II: Coastal Aquaculture and Environment, Bangkok, 1974 p 31-36.

Descriptors: *Aquiculture, *Water pollution sources, Pollutants, *Water pollution control environmental effects, Commercial fish, Marine fish, Polychlorinated biphenyls, Water quality control, Life cycles, Fish farming, Mercury.
Identifiers: *Coastal fisheries, *Sub-lethal effects, *Japan, Marine farming.

The study of sub-lethal effects of pollution on every stage of the life cycle of an organism is necessary to protect the resources of coastal fisheries and aquaculture in Japan. Protection by pollution control laws is dependant on proper biological studies of this sort. A review of the current pollutants, their effects, and current status of water pollution control and recommendations for future research activities are presented. (Katz)
W75-05013

ACCUTE TOXICITY AND DETOXIFICATION OF KRAFT PULP MILL EFFLUENT,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
R. W. Gordon, and J. A. Servizi.
International Pacific Salmon Fisheries Commission, Progress Report No 31, 1974. 26 p, 7 fig, 5 tab, 8 ref.

Descriptors: *Pulp wastes, *Toxicity, *Waste water treatment, *Bioassay, *Sockeye salmon, Laboratory tests, Analytical techniques, Toxicants, Biochemical oxygen demand, Water quality, Industrial wastes, Salmon, Suspended solids, Methodology, Effluents, Resistance, Soaps, Hydrogen ion concentration, Mortality, Fishkill, Lethal limit, Pulp and paper industry, Additives.
Identifiers: *Detoxification, *Resin acids, Dehydroabietic acid, Saponified resin acids, Biobasin, Aerated lagoon.

A laboratory simulation of a plug flow aerated lagoon was used to determine whether combined effluent of a kraft pulp mill, a mixture of biobasin and bypass effluents, could be consistently detoxified by additional treatment. Results indicated that detoxification was variable when estimated treatment times in the bench unit simulation were 29 and 58 hours. The toxic compounds remaining were identified as resin acids and toxic neutral compounds by chromatography. At 99 hours treatment time, detoxification met federal standards and BOD reduction averaged 83%. (Katz)
W75-05014

INFLUENCE OF TRINITROTOLUENE ON MICROORGANISMS AND BIOCHEMICAL SELF-PURIFICATION PROCESSES IN WATER,
Ts. I. Rogovskaya.
Available from the National Technical Information Service, Springfield, Va. 22161, AD-781 172, $3.25 in paper copy, $2.25 in microfiche. Translated from Mikrobiologiya, Vol 20, issue 3, 1951, p 265-272. Army Foreign Science and Technology Center, Charlottesville, Va., July 18, 1973. 11 p, 6 tab, 2 ref.

Descriptors: *Self-purification, *Water purification, *Biodegradation, *Toxicants, *Organic compounds, Nitrification, Industrial wastes, Water pollution, Water quality, Domestic wastes, Chemical reactions, Sewage, Biochemistry, Methodology, Microorganisms.
Identifiers: *Trinitrotoluene(TNT).

The influence of trinitrotoluene (TNT) on microorganisms and biochemical self-purification processes in water is examined as well as the nature of the process of decomposition of trinitrotoluene. Results of tests using household fecal sewage indicated that TNT may decompose as a result of biochemical processes, but only when in weak concentrations. In concentrations on an order of 0.5 - 1.0 mg/l, TNT exerts a negligible inhibitory effect on the biochemical processes of self-purification in water. A maximum concentration of TNT that is permissible for discharge into a reservoir without substantially inhibiting self-purification processes is 1 mg/l, or when purification is carried out, .10 mg/l. (Katz)
W75-05015

ESTIMATING PHYTOPLANKTON PRODUCTION FROM AMMONIUM AND CHLOROPHYLL CONCENTRATIONS IN NUTRIENT-POOR WATER OF THE EASTERN TROPICAL PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. H. Thomas, and R. W. Owen, Jr.
Fishery Bulletin, Vol 69, No 1, p 87-92, 1971. 1 fig, 2 tab, 25 ref. NSF GB-8618, NMFS 14-17-0007-963, 14-17-0007-989.

Descriptors: *Marine algae, *Pacific Ocean, *Limiting factors, *Productivity, Ammonia, Chlorophyll, Tropical regions, Nutrients, Mathematical models, Nitrogen, Primary productivity, Standing crops, Growth rates.

How concentrations of a limiting nutrient in sea water and some measure of the standing crop of phytoplankton can be used to estimate phytoplankton production is described. Enrichment and uptake experiments with various concentrations of ammonium have provided values for the half-saturation constant and the maximum growth rate, which can be used to calculate actual growth rates with the hyperbolic model relating growth rate to limiting nutrient concentration. Estimated production is compared with observed C-14 production, and the two sets of values agree reasonably well when all errors in the estimation are considered. Chlorophyll and production samples were taken from the depth of the 50% light level, which was in the upper mixed layer and varied from 9 to 16 m. Simulated in situ production was measured by adding 20 microcuries sodium-14 carbonate solution. Ammonium was measured ashore in frozen samples. This evidence supports the hypothesis that phytoplankton production in the upper mixed layer is controlled by ammonium as the limiting nutrient and shows that the hyperbolic model describes this control very well. (See also W75-05016) (Jones-Wisconsin)
W75-05019

THE EFFECT OF PLANT SPACING, NITROGEN FERTILIZER AND IRRIGATION ON THE APPEARANCE OF SYMPTOMS AND SPREAD OF VIRUS YELLOWS IN SUGAR BEET CROPS,
G. D. Heathcote.
J Agric Sci, Vol 82, No 1: p 53-60, 1974. Illus.
Identifiers: Aphids, Crops, *Fertilizers, Irrigation, *Nitrogen, *Sugar beets, Symptoms, *Virus yellows, Water pollution effects.

Satisfactory comparisons of the incidence of virus yellows in sugar beet fields or experimental plots with different amounts of N fertilizer can be made from visual symptoms early in the growing season, but not later because dressings of N fertilizer may then mask or delay the appearance of symptoms. Sugar beet plants in the field infected with beet mild yellowing virus (BMYV) are less likely to show symptoms than those with beet yellows virus (BYV), and plants with BMYV in the glasshouse often fail to show clear symptoms. Crop yield will be affected by the spread of viruses and colonization of plants by aphids, which in turn are affected by such factors as plant density, N supply and irrigation. Where ample N fertilizer is used a small increase in the percentage of plants infected with yellows can be expected, and aphids will be more numerous. Irrigation may also increase yellows incidence (e.g. from 16% to 20% of plants at Broom's Barn Experimental Station, Suffolk, England, in 1967), but any loss of potential yield from increased virus incidence will be small compared with that gained from the use of fertilizer or irrigation. Plant density can appreciably affect yellows incidence. At Broom's Barn in 1972, 51% of plants in crops with 17,5000 plants/ha contracted BMYV but only 15% of plants in crops with 126,500 plants/ha. The less dense crop lost 3-4% more of its potential yield due to yellows than the dense crop; this represents a difference due to virus of about 0.25t sugar/ha.--Copyright 1974, Biological Abstracts, Inc.
W75-05020

PRIMARY, PHYSICAL IMPACTS OF OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-11125, $11.25 in paper copy, $2.25 in microfiche. Report MITSG 74-20, April 1974. 443 p, 206 fig, 28 tab, 72 ref.

Descriptors: *Oil wells, *Offshore platforms, *Environmental effects, *Exploration, *Continental shelf, Oil spills, Oil pollution, Weathering, Evaporation, Diffusion, Transportation, Atlantic Ocean, *Alaska, Computer models, Economics, Leases, Taxes, Costs, Oil fields, Oil-water interfaces, Ocean currents, Refraction(Water waves).
Identifiers: *Gulf of Alaska.

The initial physical effects of potential oil development on the Atlantic and Gulf of Alaska continental shelves are conjectured in four studies. The first study considers a range of hypothetical oil finds and analyzes, by an offshore development computer model, investors' development strategy, the resulting oil and gas production, the number of platforms, drilling activity, and transport. The model also estimates the cost of oil and gas to the nation, investor profits and lease, royalty, and tax payments. The second study relates these production activities to the probability of oil spills and spill volume, and includes probability densities on the number and size of spills, tanker spills over 42,000 gallons and vessel spills less than 42,000 gallons, offshore production spills, and their causes. The third contribution considers hypothetical oil spill trajectories for the Atlantic coast and the Gulf of Alaska, including the mid- and south-Atlantic region, relative to wind, non-wind related currents, drift bottle data, and an assessment of impact on specific areas. The final study examines mass transport and its effect on the composition of petroleum in an oil slick. It simulates spreading, vertical diffusion of benzene and napthalene, oil slick sedimentation, and considers the effect of breaking waves. (See W75-05033 thru W75-05036) (Auen-Wisconsin)
W75-05032

SIMULATION OF HYPOTHETICAL OFFSHORE PETROLEUM DEVELOPMENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 3E.
W75-05033

ANALYSIS OF OIL SPILL STATISTICS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
J. W. Devanney, and R. J. Stewart.
In: Primary, Physical Impacts of Offshore Petroleum Developments, MITSG 74-20, p 84-212. 48 fig, 13 tab, 13 ref.

Descriptors: *Oil spills, *Probability, *Frequency analysis, Offshore platforms, Transportation, Barges, Shores, Pipelines, Oil fields.
Identifiers: *Oil spill incidence, Tankers, Oil shore terminals, Offshore moorings.

Estimates, by statistical analysis, are generated of the probabilities of spillage by number and size of individual spill for a range of hypothetical offshore petroleum developments (under present technological conditions) on the Atlantic and Gulf of Alaska continental shelf. The spill densities are derived using a Bayesian approach and assumed spill incidence is generated by a Poisson process in which the exposure variable is volume handled and spill size by a Gamma process. Available data was used to generate probability densities on the parameters of these processes starting with non-informative conjugate priors. Spillage is divided into five categories, including tankers and barges, onshore terminals, single buoy moorings, offshore

production, and offshore pipelines, and further, by large and small spills; large spills are categorized as those over 42,000 gallons, small spills under 42,000 gallons. While the size range of an individual spill is extremely large, the great majority of all spills are at the lower end of that range. However, most of the oil is spilled in a few very large spills. The incidence of spill probability in large and small oil fields is also analyzed for each category. (See also W75-05032) (Auen-Wisconsin)
W75-05034

OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W75-05035

'HUMAN-ACCELERATED EUTROPHICATION OF FRESH-WATER LAKES,' PROCEEDINGS OF A CONFERENCE,
Brooklyn Botanic Garden, Ossining, N.Y. Teatown Lake Reservation.
Held at Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, December 1973. 42 p.

Descriptors: *Water pollution control, *Ponds, *Lakes, Herbicides, Aquatic weed control, Water pollution sources, Harvesting, Nutrient removal, Biocontrol, Nutrients, Sedimentation, Algal control, Erosion, Permits, Management, *New York, Sediment control, Runoff, Water level fluctuations, Monitoring, Oxygenation, Food chains, Mechanical equipment, Dredging, Public health, Building codes, Septic tanks, Zoning, Land use, Sewage disposal, Indicators, Sealants, Coliforms.
Identifiers: Artificial lakes, Simazine, Princip 80W.

This conference was sponsored by a lake preservation organization to hear and question experts on the causes, control, and prevention of accelerated eutrophication in natural and man-made lakes. An aquatic biologist for the N.Y. State Department of Environmental Conservation discussed eutrophication--its causes and effects in fresh water lakes. A USDA-SCS conservationist discussed lake formation, sedimentation, and algae control. A CIBA-GEIGY Corporation representative presented the registration status of Simazine and its application for control of submerged vascular weeds and algae in ponds. An aquatic biologist for Resource Management presented the history of aquatic herbicides, biological control, and practical aspects of the use of chemicals in water weed control. A dredging firm representative talked on lake dredging options and mechanical water weed harvesters. An aquatic biologist described restoration of eutrophic lakes by artificial hypolimnion oxygenation. The assistant commissioner of Health for Environmental Services of Westchester County outlined requirements, sewage disposal systems, permits required for chemical treatment of aquatic vegetation, authorized chemicals, dredging permits, sources of lake enrichment, and building regulations. An environmental editor contributed views on land use and zoning, septic effluents and the responsibility for adequate control. A diagnostic consultant presented indicators of eutrophication: visual, chemical, physical, and biological. (See W75-05038 thru W75-05046) (Auen-Wisconsin)
W75-05037

'EUTROPHICATION'--ITS CAUSES AND EFFECTS IN FRESH WATER LAKES,
New York State Dept. of Environmental Conservation, New Paltz.
R. A. Greene.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 4-7.

Descriptors: *Eutrophication, *Water pollution sources, *Lakes, Chemcontrol, Aquatic weed control, Fisheries, Water pollution treatment, *New York, Nutrient removal, Biocontrol, Government finance, Copper sulfate, Carp, Oil spills.
Identifiers: Water chestnut, Duckweed.

Each lake must be considered as a living entiety with its own set of problems and its own physical, chemical, and biological characteristics. Eutrophication control efforts should be balanced with the intended use of the lake. While chemicals are effective for weed control in spot treatment applications, their major drawback is that they only treat the symptoms of the problem. Eutrophic conditions in lakes, such as increased productivity and turbidity, hinder game fish and contribute to the incidence of summer and winter fishkill. Nutrient removal is the best method for controlling eutrophication, and is most effective when the sources are eliminated. Harvesting and removal of plants which contain nutrients has worked in some cases; fish harvest is another method of nutrient removal. The water chestnut control program in New York State is based on killing the plant before it produces seeds and has proven very successful. After ten years the control program is now reduced to minor hand pulling and hand spraying of chemicals. Questions regarding state and federal assistance for runoff control and aquatic weed control, copper sulfate applications for algal control, Chinese grass carp, and damage from gasoline and oil spills are answered. This presentation is directed to laymen. (See also W75-05037) (Auen-Wisconsin)
W75-05038

LAKE FORMATION, SEDIMENTATION, CONTROL OF ALGAE, QUESTIONS,
Soil Conservation Service, New City, N.Y.
R. S. Jonas.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,'proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 8-12.

Descriptors: *Lakes, *Management, *Sedimentation, *Aquatic weed control, Erosion, Depth, Shores, *New York, Ducks(Domestic), Runoff, Nutrients, Light penetration, Organic wastes, Algal toxins, Surface sealing, Septic tanks, Sediment control.
Identifiers: Light limitation, Westchester County(N.Y.).

This presentation was directed to a group of citizens concerned about lake quality. Causes of eutrophication are erosion or movement of soil into lakes and aquatic growth spurred by nutrient import. The deeper a lake is, the easier it is to manage. In designing a pond a steep shoreline and maximum depth are recommended. Recommendations for management of submerged plants in a newly-created lake are light limitation by various methods. The best sealant for a leaky pond is duck effluent. Ninety-five percent of sediment import from disturbed soil can be controlled by rigid control of construction methods, and by revegetation of all disturbed areas as soon as possible with at least temporary cover; another good method is construction of sediment retention basins. Aquatic growth is affected by three major factors: temperature, nutrients, and sunlight. A method of aquatic plant control is water level fluctuation; another suggestion is to cover a small area with plastic, moving it every three weeks, in which time the weeds will be killed. Lake reclamation may be effected by mechanical methods by removing the bottom material, both vegetative and sedimentary. (See also W75-05037) (Auen-Wisconsin)
W75-05039

THE REGISTRATION STATUS OF SIMAZINE FOR SUBMERGED VASCULAR WEEDS AND ALGAE CONTROL IN PONDS,
Ciba-Geigy Corp., Greensboro, N.C.
For primary bibliographic entry see Field 5G.
W75-05040

HISTORY OF AQUATIC HERBICIDES, BIOLOGICAL CONTROL, PRACTICAL ASPECTS OF THE USE OF CHEMICALS IN WATER WEED CONTROL,
Resource Management, Inc., Freehold, N.J.
For primary bibliographic entry see Field 5G.
W75-05041

LAKE DREDGING OPTIONS AND MECHANICAL WATER WEED HARVESTERS,
Folsom Marine Service Corp., Plymouth, N.H.
For primary bibliographic entry see Field 5G.
W75-05042

RESTORATION OF EUTROPHIC LAKES BY ARTIFICIAL HYPOLIMNETIC OXYGENATION,
Union Carbide Corp., Tarrytown, N.Y. Aquatic Environmental Sciences.
A. W. Fast.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 21-34, 18 fig.

Descriptors: *Eutrophication, *Hypolimnion, *Oxygenation, Nutrients, Bottom sediments, Phosphorus, Aeration, Destratification, Thermal stratification, Nitrogen, Chlorophyll, Cold-water fish, *New York, Mechanical equipment.
Identifiers: *Lake rehabilitation, Liquid oxygen, Compressed air, *Lake Waccabuc(NY).

In unproductive lakes, oxygen concentrations in the hypolimnion are usually greater than 5 ppm, and these lakes support cold water fishes. Hypolimnetic oxygen concentrations in productive, eutrophic lakes, on the other hand, are zero. Associated with hypolimnetic oxygen depletion, is resolution of nutrients (such as phosphorus from the bottom sediments. Several procedures have been used to alleviate eutrophication: reducing nutrient inflow, dredging and removal of sediments, chemical treatment, weed removal, and artificial oxygenation. Lake aeration systems are divided into two categories: destratification and hypolimnion aeration. A Limno aeration system was installed and tested in Lake Waccubuc, New York, while Lake Oscaleta, New York, was the control. Results conclusively demonstrated that the Limno system can oxygenate the hypolimnion without appreciably changing the thermal conditions in the lake. Phosphorus, nitrogen, and chlorophyll content were measured throughout the summer. A second type of hypolimnetic oxygenation system uses liquid oxygen and a water pump rather than compressed air. Hypolimnetic free carbon dioxide was more uniform; concurrently, pH had decreased slightly, but alkalinity had remained unchanged and the physical appearance of the lake improved. This presentation was directed to a group of citizens concerned about lake quality. (See also W75-05037) (Jones-Wisconsin)
W75-05043

PUBLIC HEALTH REQUIREMENTS, SEWAGE DISPOSAL SYSTEMS, PERMITS REQUIRED FOR CHEMICAL TREATMENT OF AQUATIC VEGETATION, AUTHORIZED CHEMICALS, DREDGING PERMITS, SOURCES OF LAKE ENRICHMENT, BUILDING REGULATIONS,
Westchester County Dept. of Health, White Plains, N.Y. Div. of Environmental Health Services.
For primary bibliographic entry see Field 5G.
W75-05044

LAND USE AND ZONING, SEPTIC EFFLUENTS AND THE RESPONSIBILITY FOR ADEQUATE CONTROL,
Yorktown School System, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 5G.
W75-05045

INDICATORS OF EUTROPHICATION: VISUAL, CHEMICAL, PHYSICAL, BIOLOGICAL,
Limnology Information and Freshwater Ecology, Inc., Carmel, N.Y.
P. Roland.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 40-41.

Descriptors: *Indicators, *Eutrophication, *Trophic level, Algae, Aquatic weeds, *Bioindicators, Coliforms, Public health, Oil pollution, Dissolved oxygen, Hydrogen ion concentration, Ammonia, Phosphates, Pollutant identification.

Evidence of eutrophication is clearly seen in the extent of emergent and submergent weeds and the densities and types of algal growth. In addition to these indicators there are chemical and other biological methods to determine the extent and distribution of nutrient levels within a body of water. The number of coliform bacteria, although not an indicator of trophic state, are used by health departments to determine potential health hazards of a recreational lake. Oil on water, although not itself a nutrient, causes adjunctive problems, the oil slick on the water prohibits oxygen absorption from the atmosphere. Chemical determination of dissolved oxygen should be conducted frequently at testing locations. Another indicator to determine the trophic state of a lake is pH. As an exampie, basic values may reveal production of tremendous quantities of ammonia. While phosphates are abosrbed rapidly by growing terrestrial plants, in an aquatic environment the mobility and movement of photobiotic plants (also algae) and the mixing of waters determine the phosphate uptake. Sometimes these chemicals are released from the sediment or introduced by cultural developments surrounding the water body. This presentation was directed to a group of citizens concerned with lake quality. (See also W75-05037) (Jones-Wisconsin)
W75-05046

A GUIDE TO THE MEASUREMENT OF MARINE PRIMARY PRODUCTION UNDER SOME SPECIAL CONDITIONS,
United Nations Educational, Scientific and Cultural Organization, Paris(France).
For primary bibliographic entry see Field 5A.
W75-05047

PHOSPHORUS AND HYPOLIMNIAL DISSOLVED OXYGEN IN LAKE ERIE,
Canadian Wildlife Service, Ottawa (Ontario).
M. Gilbertson, H. H. Dobson, and T. R. Lee.
In: Project Hypo. An Intensive Study of the Lake Erie Central Basin Hypolmnion and Related Surface Water Phenomena. Environmental Protection Agency, Fairview Park, Ohio, Technical Report TS-05-71-208-24, February 1972, p 141-145, 2 fig, 4 tab, 7 ref.

Descriptors: *Lake Erie, *Phosphorus, *Hypolimnion, *Dissolved oxygen, Eutrophication, Lakes, Water pollution effects.

The possible interrelationship between phosphorus contributions to Lake Erie and oxygen depletion in the hypolimnion of the Central Basin, as an indicator of the lake's trophic state is discussed. Estimates of phosphorus loadings from the human population of the Lake Erie Basin and its use of detergents and estimates of the oxygen depletion rates in the Central Basin from 1931 to the present are compared. Phosphorus loadings are graphically shown, in total, and by detergent phosphorus, and human excrement alone. To comply with the International Joint Commission's proposed phosphorus loading limitations, it would appear that a reduction to at least 12,000 tons in the municipal contribution of phosphorus is required to return oxygen conditions in the lake to a level approximating conditions prevailing in 1955. In order to return to conditions which are economically and aesthetically satisfactory, woul mean an estimated reduction in the total phosphorus loading to a level of some 11,100 tons/year. If that objective is met, and the lake responds in the same manner to decreasing phosphorus loads as it appears to have behaved to increasing loads, then the probable oxygen depletion rate will drop below 2 mg/1/month and may approximate hypolimnial conditions prior to 1931. (See also W72-12990 thru W72-12997) (Auen-Wisconsin)
W75-05050

THE EFFECT OF SEWAGE FROM THE TOWN OF KRYNICA ON THE BENTHIC INVERTEBRATES COMMUNITIES OF THE KRYNICZANKA STREAM,
Polish Academy of Sciences, Krakow. Zaklad Ochrony Przyrody.
W75-05051

SURFACE NITROGEN AND PLANKTON IN SKAHA LAKE, BRITISH COLUMBIA (CANADA),
British Columbia Univ., Vancouver. Dept. of Biology.
D. L. Findley, D. I. Findley, and J. R. Stein.
Freshwater Biology, Vol 3, p 111-122, 1973. 6 fig, 27 ref.

Descriptors: *Nitrogen, *Surface waters, *Plankton, *Cyanophyta, *Nitrogen fixation, *Canada, Analytical techniques, Seasonal, Phytoplankton, Zooplankton, Temperature, Phosphates, Nitrates, Ammonia.
Identifiers: *Skaha Lake(British Columbia), Gloeotrichia echinulata, Acetylene reduction.

Utilization of the acetylene reduction method as a survey tool for potential in situ nitrogen fixation assays is described and results correlated with several biological and chemical parameters in an effort to better understand the relationship between nitrogen fixation and its effects on eutrophication. Oligotrophic Skaha Lake is fourth of the six larger lakes in the Okanagan Valley located in the dry interior of southcentral British Columbia. Plankton samples were taken from the top meter and phytoplankton and zooplankton populations counted. Acetylene reduction assays were performed in situ and indicated an increase in ammonia-nitrogen before and after peak acetylene reduction. The presence of complex interrelations between plankton and nitrogen levels in surface waters is indicated. Generally inorganic nitrogen was high in the winter (0.4-0.5 ppm) and low in summer (less than 0.1 ppm). However, in late July and August a large increase in nitrogen (1.5 ppm) was recorded. This correlated with the Gloeotrichia echinulata bloom and the increase in nitrogen fixation, or nitrogenase activity (measured as acetylene reduction). It was calculated that the cyanophyte bloom could have contributed a minimum of 2350 kg nitrogen to the lake in August 1970 which is about 62% of the nitrate-nitrogen occurring at any time. (Jones-Wisconsin)
W75-05053

THE UTILIZATION OF NITROGEN FROM THE DECOMPOSITION OF MATTER IN CULTURES OF SCENEDESMUS DIMORPHUS,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Archiv fur Hydrobiologie, Vol 73, No 3, p 361-368, 1974. 4 fig, 1 tab, 13 ref.

Descriptors: *Cycling nutrients, *Nitrogen, *Decomposing organic matter, *Nutrient requirements, Cultures, Scenedesmus, Aquatic plants, Mud, Productivity, Alabama, Inorganic compounds.
Identifiers: *Nitrogen sources, *Scenedesmus dimorphus, Nitrogen mineralization.

Since availability of inorganic nitrogen is an important factor regulating aquatic productivity and nitrogen is often associated with eutrophication, information on the regeneration of inorganic nitrogen from decaying organic matter is valuable in both theoretical and practical considerations of aquatic resources. This study was initiated to evaluate muds, aquatic plant residues, and organic compounds as nitrogen sources for Scenedesmus dimorphus in laboratory cultures. Pure cultures of S. dimorphus did not readily utilize glutamic acid or proteose peptone directly as sources of nitrogen. However, when decomposer organisms were added nitrogen was mineralized at a sufficient rate to produce good growth. Decaying aquatic plants were used as the only source of nitrogen in S. dimorphus cultures. Phytoplankton (Microcystis, Anabaena, and Euglena) and a macrophyte (Najas) produced the best algal growth, while the macrophytes Typha and Eichhornia supported little algal growth. Intermediate growth was obtained with the macrophytes Elodea and Spirogyra. The suitability of decaying plants as nitrogen sources was generally greater in plants with higher nitrogen contents. Insufficient nitrogen was mineralized from muds to produce significant growth of S. dimorphus under the culture conditions employed. (Jones-Wisconsin)
W75-05054

THE INDICATOR ORGANISMS AND THEIR ECOLOGICAL VARIABILITY,
Water Economics Research Inst., Krakow (Poland). Dept. for Water Protection.
L. Turoboyski.
Acta Hydrobiologica, Vol 15, No 3, p 259-274, 1973. 1 tab, 8 ref.

Descriptors: *Bioindicators, *Ecological distribution, *Water pollution, Benthic flora, Benthic fauna, Bacteria, Fungi, Cyanophyta, Euglenophyta, Diatoms, Scenedesmus, Chlorophyta, Protozoa, Oligochaetes, Mollusks, Mayflies, Stoneflies, Crustaceans.
Identifiers: Saprophagic organisms.

The water pollution is evaluated on the basis of the communities of organisms and this evolution is considered indispensable in biological analysis. The dominance of one of the four main ecological groups of aquatic organisms may characterize the water of the sapronbionic organisms as very strongly polluted; of the saprophilous organisms as strongly polluted; of saproxenous organisms as slightly polluted (organic compounds almost mineralized); of the saprophobous organisms as very slightly polluted or pure. The species of organisms within these ecological groups are classified. A number of indicator species of plant and animal organisms of the micro- and macrobenthos from various rivers were selected, their zonal association and resistance to different kinds of pollution were determined according to the communities of indicator organisms and on the basis of chemical investigations. A number of organism species were classified as individual ecological groups. The organisms of the physiological groups of consumers are discussed. The frequency of occurrence of individual systematic indicator units are presented and their environmental background characterized in the form of specific of wastes. (Jones-Wisconsin)
W75-05055

EXPERIMENTAL LAKES AREA: WHOLE-LAKE EXPERIMENTS IN EUTROPHICATION,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, and E. J. Fee.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 937-953, 1974. 9 fig, 51 ref.

Descriptors: *Lakes, *Eutrophication, Nutrients, Phosphates, Nitrates, Phytoplankton, Carbon, Phosphorus, Nitrogen, Hypolimnion, On-site investigations, *Canada.
Identifiers: *Experimental Lakes Area(Canada).

A realistic eutrophication study is a whole-lake experiment in which budgets of major nutrients are accurately manipulated. By changing the nutrient budgets in a precisely known way, one can observe the actual response of a whole, natural system to known enrichments with different rates of a single nutrient or different combinations of nutrients. Results give a clear answer about the environmental importance of the nutrient. Lake 227, fertilized with phosphate and nitrate, showed an enormous increase in phytoplankton, in spite of low carbon concentrations; carbon necessary for algal blooms was found to invade from the atmosphere. Lake 304, eutrophied by fertilization with phosphorus, nitrogen, and carbon in 1971 and 1972, recovered rapidly when phosphorus fertilization was terminated. Lake 226 was split in half with a curtain; one-half was fertilized with carbon and nitrogen and the other was fertilized with phosphorus, carbon, and nitrogen. The half receiving phosphorus developed an algal bloom and the other half did not. Lake 302, which had carbon, nitrogen, and phosphorus added to the hypolimnion, did not develop algal blooms in summer. These studies illustrate that phosphorus control is an efficient primary step in preventing or checking eutrophication problems. (Jones-Wisconsin)
W75-05057

HYDROBIOLOGICAL OBSERVATIONS ON THREE RHODESIAN RESERVOIRS,
Rhodesia Univ., Salisbury. Div. of Biological Sciences.
D. S. Mitchell, and B. E. Marshall.
Freshwater Biol. Vol 4, No 1, p 61-72, 1974, Illus.
Identifiers: Algae, *Eutrophication, Hydrobiological studies, Oxygen, *Phytoplankton, Reservoirs, *Rhodesia, Seasonal, Sewage, Stratification, *Cyanophyta, Africa, Water pollution effects, *Primary productivity.

Hydrobiological studies were carried out on 3 Rhodesian reservoirs in 1970-71. Lake McIlwaine receives sewage effluent and has become highly eutrophic. Mazoe and Mwenje dams are not enriched, but Mwenje shows certain eutrophic features, probably because it is the most recently constructed. Seasonal variation was investigated and the 3 lakes conform to the warm monomictic type, with stratification in summer and isothermal conditions in winter. Mwenje which remains de-oxygenated in winter, probably because of trapped organic matter in the bottom waters. Alkalinity, conductivity and pH also remain stratified in Mwenje during winter. De-oxygenation does not persist in McIlwaine despite its eutrophic condition, which appears to be a result of complete mixing brought about by its weak thermal structure and its open exposed morphometry. Mazoe shows no peculiar thermal features and the basic monomictic pattern is clearly defined in this lake. Diurnal variation of physicochemical conditions was also investigated and found to be slight. No evidence of polymixis or hypolimnetic mixing was found. Phytoplankton populations in the 3 lakes are clearly related to their chemical nature. Lake McIlwaine has a large population of blue-greens, reflecting its eutrophic nature, while the other 2 have more diverse populations reflecting their mesotrophic status. Primary productivity, in turn, is related to phytoplankton populations. Productivity as measured by O2 production is high in the Lake McIlwaine and is about 3 times higher than in the other lakes.--Copyright 1974, Biological Abstracts, Inc.
W75-05059

EXPERIMENTAL DREDGING TO CONVERT LAKE BOTTOM FROM ABIOTIC MUCK TO PRODUCTIVE SAND,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
For primary bibliographic entry see Field 5G.
W75-05060

OCCURRENCE OF MORPHOLOGICALLY ABNORMAL SYNEDRA POPULATIONS IN LAKE SUPERIOR PHYTOPLANKTON,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
L. E. Feldt, E. F. Stoermer, and C. L. Schelske.
In: International Association Great Lakes Research, Proceedings 16th Conference Great Lakes Research, p 34-39, 1973. 2 fig, 11 ref. AEC AT(11-1)-2003.

Descriptors: *Diatoms, *Evolution, *Lake Superior, Phytoplankton, Plant morphology, Speciation.
Identifiers: *Morphological modification, *Synedra, Diatom mutants, Synedra radians, Synedra ulna var. chaseana.

Diatoms are the most important component of phytoplankton assemblages in Lake Superior. Since diatom taxonomy is based largely on the structure of their hard parts, sports or 'lusus formen' may be a source of taxonomic confusion. Numerous examples of a variant population of Synedra have been noted in which the central portion of the valve is strongly incised and the entire frustule is longitudinally asymetric in collections from Lake Superior. Although its identity cannot be firmly established, the organism appears to be a teratological form, perhaps related to S. radians. On the basis of samples available, this entity first appeared and has remained most abundant at stations in the western basin, but has become increasingly widespread and abundant in other regions of the lake in recent years. It was present in 4 of 21 samples collected in 1968, 23 of 30 samples collected in 1970 and in all samples collected in 1971. It was not present in samples available from 1966. The occurrence of a few specimens of S. ulna var. chaseana in the samples examined, which have undergone similar morphological modification, is also noted. (Jones-Wisconsin)
W75-05062

THE 'OLIGOTROPHICATION' OF LITTLE OTTER LAKE, PARRY SOUND DISTRICT,
Ministry of Environment, Rexdale (Ontario). Limnology and Toxicity Branch.
M. F. P. Michalski, and N. Conroy.
In: International Association Great Lakes Research, Proceedings 16th Conference Great Lakes Research, p 934-948, 1973. 9 fig, 5 tab, 14 ref.

Descriptors: *Eutrophication, *Phosphorus, *Pollution abatement, *Lakes, Industrial wastes, Secchi disks, Phosphates, *Canada, Self-purification, Nutrient removal, Oligotrophy.
Identifiers: *Little Otter Lake(Ontario).

Little Otter Lake, a small lake in the Precambrian Shield, south of Parry Sound, Ontario was subjected to an industrial waste discharge during July and August of 1971, which contained high concentrations of a polyphosphate descaling agent. Approximately 265 kg of phosphorus was discharged to the lake. In 1971 the lake developed classical symptoms of accelerating eutrophy, including a dense algae bloom dominated by Anabaena limnetica, reduced Secchi disc transparencies, high concentrations of chlorophyll-a, and total phosphorus (44-110 micrograms per liter). The situation was somewhat unique because the only significant input was phosphorus and the lake was essentially a closed system during the summer. In August of 1971, the polyphosphate discharges were discontinued, reducing the loading. Concomitant improvements in water quality in 1972 included a reduction in phytoplankton densities to levels typical of oligotrophic Precambrian Shield lakes, an increase in Secchi disc transparencies and a decrease in total phosphorus and chlorophyll-a concentrations. Other key nutritional values were essentially the same in 1970 through 1972. Some caution must be exercised in predicting benefits that will accrue for all situations based on the Little Otter Lake results, as the lake is not a typical example of a continuously affected system. (Jones-Wisconsin)
W75-05063

ANAEROBIC METABOLISM IN LAKE WASHINGTON SEDIMENTS,
Washington Univ., Seattle, Dept. of Oceanography.
M. M. Pamatmat, and A. M. Bhagwat.
Limnology and Oceanography, Vol 18, No 4, p 611-627, 1973. 9 fig, 2 tab, 39 ref. AEC RLO-2225-T26-9. EPA 16070 EKZ, AEC AT(45-1)-2225.

Descriptors: *Analytical techniques, *Anaerobic conditions, *Metabolism, *Sediments, *Washington, Hydrogen, Bacteria, Oxygen, Energy, Heat, Benthos, Entropy, *Pollutant identification, Lake sediment.
Identifiers: *Dehydrogenase activity, *Lake Washington(Wash), Calorimetry, Triphenyltetrazolium chloride.

A method of measuring dehydrogenase activity with the use of triphenyltetrazolium chloride was adapted and results compared with those of direct microcalorimetry. Results show that TTC can be used for estimates of the naturally occurring rates of anaerobic metabolism, at least by bacteria, in subsurface sediments. The method was used aboard ship in Lake Washington at the same time that the oxygen uptake by replicate sediment cores was being measured. Dehydrogenase activity varies from place to place and differs between layers of the same core. Although there is a general trend of decreasing activity with sediment depth, some subsurface layers have relatively high activity. Dehydrogenase activity, which was detected down to the deepest layers of sediment cores, 21 to 31 cm, appears to be more a function of plankton remains than of total organic carbon in the sediment. The integrated metabolic heat release based on dehydrogenase activity of the entire core was invariably greater than the metabolic heat release calculated from the rates of oxygen uptake. Thus, it appears that the rate of total oxygen uptake by the sediment surface underestimates benthic community metabolism in the sediment column. (Jones-Wisconsin)
W75-05064

OBSERVATIONS OF THE VERTICAL DISTRIBUTION OF THE BENTHOS IN A MALAYSIAN STREAM,
Malaya Univ., Kuala Lumpur (Malaysia). School of Biological Sciences.
J. E. Bishop.
Freshwater Biology, Vol 3, p 147-156, 1973. 2 fig, 2 tab, 46 ref.

Descriptors: *Spatial distribution, *Benthos, *Streams, *Analytical techniques, Bottom sampling, Depth, Sediments, Biological communities, Technology, Invertebrates.
Identifiers: *Malaysia, Sungai Gombak(Malaysia).

The vertical distribution of the benthos in a region of stable sediments in a small river, Sungai Gombak, in the hill-forest zone in Malaysia was measured by a specifically designed apparatus of simple design, utilizing the colonization of a known volume of supplied substrate. The apparatus consists of a rectangular box 20 x 10 x 10 cm, made of

23 gauge galvanized iron sheeting. Distribution of the invertebrates by group was spread irregularly over the four depths with the 0-10 and 20-30 cm levels generally containing higher proportions than other strata. Size distribution of the fauna at each depth showed few differences between depths. The apparatus is capable of sampling the benthic fauna to a depth of 50 cm by providing a natural substrate for colonization. The results obtained from an area of visually uniform sediments demonstrate that stream animals occur in significant numbers deep in the bottom sediments and that, at most, only about half the benthos lives in the upper 10 cm which is usually 'quantitatively' sampled in stream surveys. The significance of a deep-living fauna in regulating community density, in recolonizing denuded areas, and in optimizing utilization of available food resources is discussed. (Jones-Wisconsin)
W75-05066

PHOSPHATE, ALGAE AND TACONITE TAILINGS IN THE WESTERN ARM OF LAKE SUPERIOR,
Texas Univ. at Dallas, Richardson. Inst. of Environmental Sciences.
R. H. Plumb, and G. F. Lee.
1973, 59 p. 12 fig, 7 tab, 25 ref.

Descriptors: *Eutrophication, *Lake Superior, *Industrial wastes, Sorption, Leaching, Phosphates, *Minnesota, *Wisconsin.
Identifiers: *Taconite tailings, Duluth(Minn), Superior(Wis), Reserve Mining Company.

The Reserve Mining Company operates a taconite beneficiation plant at Silver Bay, Minnesota, Lake Superior's north shore. Findings of several chemical and biological investigations of phosphate associated with taconite tailings are presented. Taconite tailings samples were obtained by quiescent settling of total taconite tailings and were defined as material that would not settle more than 12.5 cm in seven hours. Phosphate was not leached from taconite tailings during the long-term laboratory leaching studies. In fact, tailings have the capacity to remove 2-7 micrograms phosphate-phosphorus per gram tailings from solution by the sorption process. The fact that Selenastrum responded to tailings plus phosphate but not to tailings alone demonstrated that tailings are non-toxic and non-stimulatory. The phosphate associated with tactonic tailings is shown not to be biologically available. Data suggest that the discharge of taconite tailings is not exerting a localized stimulation or inhibition effect on the algal population. Cause of the algal population maximum in the nearshore survey area is the increased phosphate flux from the Duluth-Superior population center. Laboratory and field studies clearly show that Reserve Mining Company's discharge of taconite tailings is not contributing to eutrophication of Lake Superior. (Jones-Wisconsin)
W75-05067

SEDIMENTS AND SEDIMENT-WATER NUTRIENT INTERCHANGE IN UPPER KLAMATH LAKE, OREGON,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
W. D. Sanville, C. F. Powers, and A. R. Gahler.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.10. Environmental Protection Agency, Ecological Research Series Report, EPA-660/3-74-015, August 1974. 45 p, 5 fig, 16 ref, append.

Descriptors: *Sediments, *Nutrients, Water quality, *Lake sediments, Eutrophication, Agricultural chemicals, *Oregon, *Cyanophyta.
Identifiers: *Upper Klamath Lake(Ore), Aphanizomenon flos-aquae.

Upper Klamath Lake, a very large, shallow lake in south-central Oregon, has a history of nuisance blue-green algae blooms, predominantly Aphanizomenon flos-aquae. Lake water and sediment interstitial water chemistry were monitored during 1968 and 1969, and for a short time in 1970. Nutrient concentrations in interstitial water of sediment exposed to direct agricultural drainage were several orders of magnitude greater than in cases where sediments were no so located. Nutrient concentrations showed considerable seasonal variation in both interstitial and lake waters. Variations in lake and interstitial waters frequently, but not always, exhibited inverse relationships. The larger fluctuations appeared to correlate with density of A. flow-aquae. Although strong evidence of biological uptake of sedimentary nutrients was found, dredging of the lake would probably not be effective as a restorative measure because of the high nutrient concentrations present at depth in the sediment. (EPA)
W75-05079

ESTIMATING NUTRIENT LOADINGS OF LAKES FROM NON-POINT SOURCES,
Wisconsin Univ., Madison. Water Resources Center.
P. D. Uttormark, J. D. Chapin, and K. M. Green.
For sale by the Superintendent of Documents, U.S. Printing Office, Washington, D.C. 20402, Price $1.90. Environmental Protection Agency, Ecological Research Series Report, EPA-660/3-74-020, August 1974. 112 p, 6 fig, 2 tab, 81 ref. EPA Program Element 1BA031, Grant R-801343.

Descriptors: *Nutrients, *Eutrophication, Control, Management, Drainage, Nitrogen, Phosphorus, Agriculture, Estimating, Chemical properties, Runoff, Groundwater, Fallout, Sewage, Precipitation(Atmospheric), Seepage, Urban runoff, Forests, Marshes, Wetlands, Septic tanks, Lakes, *Water pollution control, Path of pollutants.
Identifiers: *Lake management, Nutrient load, Nutrient sources.

Data describing nutrient contributions from nonpoint sources were compiled from the literature, converted to kg/ha/yr, and tabulated in a format convenient for estimating nutrient loadings of lakes. Contributing areas are subdivided according to general use categories, including agricultural, urban, forested, and wetland. Data describing nutrient transport by groundwater seepage and bulk precipitation are given along with data for nutrient contributions from manure handling, septic tanks, and agricultural fertilizers. Nutrient content of urban runoff was the highest; forested areas were lowest. Nutrient export data for agricultural lands were tabulated as seepage through vertical soil profile, overland runoff, and transport by streams draining agricultural watersheds. The latter group was judged to be most applicable for estimating nutrient loading of lakes. Marshes appear to temporarily store phosphorus and nitrogen during the growing season and release them at a later time; net nutrient runoff is estimated to be near zero. Nutrient contributions to lakes from groundwater seepage require site-specific information for assessment. Phosphorus and nitrogen transport by groundwater can be significant. Atmospheric contributions of nitrogen are large in some areas. The technique of estimating nutrient loadings of lakes requires considerable judgement in selecting runoff coefficients; however, the approach provides insight into potential management options. (EPA)
W75-05082

ARSENIC CONTAMINATION OF DRINKING WATER AND FOOD-STUFFS CAUSING ENDEMIC CHRONIC POISONING,
R. Zaldivar.
Beitr Pathol. 151(4): 384-400. Illus. 1974.
Identifiers: *Potable water, Adults, *Arsenic, Carcinoma, Cell, Children *Chile(Antofagasta), *Endemic chronic poisoning, Foodstruffs, Infarction, Keratosis, Leukoderma, Melanoderma, Pollution, Squamous, Thrombosis, Water pollution effects, *Human poisoning.

An investigation on patients with chronic As poisoning from the city of Antofagasta, Chile, and concentrations of As in drinking water was performed. During the period 1968-1971, a total of 457 patients (208 males, 249 females) bearing cutaneous lesions (leukoderma, melanoderma, hyperkeratosis, squamouscell carcinoma) were registered. Children (0-15 yr of age) accounted for 69.2% of male cases, and for 77.5% of female cases. These patients exhibited high As content in the hair. The mean concentration of As in drinking water in the period 1968-1969 was 0.58 ppm vs. 0.08 ppm in 1971, differing by a factor of 7.2. Such differences was due to a filter plant which started operation in May 1970. The average incidence rates per 100,000 population for cases with cutaneous lesions in 1968-1969 were 145.5 for males and 168.0 for females. The incidence rates decreased in 1971 to 9.1 for males and 10.0 for females. Among the 337 registered children, 5 died showing thrombosis of brain arteries, thrombosis of mesenteric artery, restriction of lumen of coronary arteries, and/or myocardial infarction. Of the 64 registered adult males, 2 developed multiple skin carcinomata with lymph node metastases.--Copyright 1974, Biological Abstracts, Inc.
W75-05177

PLANKTON POPULATIONS OF LAKE LEAKE AND TOOMS LAKE: OLIGOTROPHIC TASMANIAN LAKES,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
R. L. Croome, and P. A. Tyler.
Br Phycol J. 8(3): 239-247. Illus. 1973.
Identifiers: *Australia(Tasmania), Cyclotella-Stelligera, Lake Leake, Lakes, *Oligotrophic lakes, *Plankton populations, Tooms Lake, Standing crops.

The characteristic feature of Lake Leake and Tooms Lake (Australia) is their great similarity in physical and chemical limnology. This similarity extends to the plankton populations in general terms, both lakes being dominated by Cyclotella stelligera Cleve et Grun. and having few other species. Floristic differences are minimal. Distinct differences exist in plankton periodicity, principally in that of C. stelligera. The extreme oligotrophy of the lakes, already suspected from their low nutrient levels, is confirmed by the extremely meager standing crops.--Copyright 1974, Biological Abstracts, Inc.
W75-05183

MERCURY LEVELS IN LAKE POWELL: BIOAMPLIFICATION OF MERCURY IN MAN-MADE DESERT RESERVOIR,
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 5A.
W75-05185

SOURCES AND TRENDS IN WASTE WATER LOADINGS TO THE SAN FRANCISCO BAY REGION,
Sir George Williams Univ., Montreal (Quebec). Dept. of Economics.
For primary bibliographic entry see Field 5B.
W75-05186

A MODEL TO STUDY THE EFFECTS OF TIME-VARIABLE POLLUTANT LOADS ON STREAM QUALITY,
Saint Catharines (Ontario).
For primary bibliographic entry see Field 5B.
W75-05187

SURVIVAL TIME AND LETHAL EXPOSURE TIME FOR THE BLACKNOSE DACE EXPOSED

TO FREE CHLORINE AND CHLORAMINE SOLUTIONS,
Maryland Univ., Prince Frederick. Center for Environmental and Estuarine Studies.
C.-H. Tsai, and J. A. Tompkins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 958, $3.75 in paper copy, $2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 30, (1974). 24 p, 4 fig, 5 tab, 18 ref. OWRT B-006-Md(5). 14-01-0001-1910.

Descriptors: *Chlorine, Ammonium compounds, *Mortality, *Toxicity, *Lethal limit, Water pollution effects, Bioassay.
Identifiers: *Chloramines, *Blacknose dace, Ammonium chloride, Exposure time(Fish), Survival time(Fish).

The survival time and lethal exposure time were determined by continuous flow bioassay for the blacknose dace, Rhinichthys atratulus, exposed to four concentrations each of free chlorine solutions, 0.15, 0.74, 1.38 and 6.60 mg/l and of chloramine solutions, 0.19, 0.51, 1.31 and 5.25 mg/l as total chlorine. The lethal exposure time is shorter than the survival time for the concentrations tested. The difference between the median lethal exposure time and median survival time decreases with a decrease in total chlorine concentrations and becomes similar at the concentration 0.09 mg/l for the free chlorine solutions and 0.21 mg/l for the chloramine solutions. Using either the median survival time or median lethal exposure time as the toxicity index, free chlorine is more toxic than chloramines to the blacknose dace at high concentrations, but less so in low concentrations.
W75-05272

PROCEEDINGS OF THE FIRST ANNUAL NSF TRACE CONTAMINANTS CONFERENCE.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W75-05277

UTILITY OF PLACENTAL TISSUE AS AN INDICATOR OF ENVIRONMENTAL EXPOSURE,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 5A.
W75-05284

STABLE ISOTOPE STUDIES OF HUMAN LEAD METABOLISM,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5A.
W75-05285

A NETWORK TO DETERMINE CAUSALITY BETWEEN ABNORMAL TRACE ELEMENT LEVELS IN COGENITAL DEFECTS,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 5A.
W75-05286

BIOLOGY OF MOLYBDENUM: PLATELET BIOCHEMISTRY AND FUNCTION - POSSIBLE USE IN EVALUATING TRACE METAL EFFECTS,
Colorado Univ., Denver. Dept. of Medicine and Pediatrics.
For primary bibliographic entry see Field 5A.
W75-05287

BEHAVIORAL EFFECTS OF METHYLMERCURY,
Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.
For primary bibliographic entry see Field 5A.
W75-05288

THE EFFECT OF MERCURIALS ON DNA-MEDIATED TRANSFORMATION IN BACILLUS SUBTILIS,
Rochester Univ., N.Y. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W75-05289

THE UPTAKE AND SOME PHYSIOLOGICAL EFFECTS OF CADMIUM ON CORN,
Illinois Univ., Urbana. Dept. of Agromony.
D. E. Koeppe, R. J. Miller, R. A. Root, J. E. Bittell, and C. Malone.
In: Proceedings of the First Annual NSF Trace Contaminants Conferenc August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 553-563, 7 fig, 20 ref.

Descriptors: *Cadmium, *Corn(Field), *Absorption, *Plant physiology, *Toxicity, Oxidation, Plant pathology, Zinc, Nickel, Manganese, Cobalt, Analytical techniques, Electron microscopy, Cations, Water pollution effects, Pollutant identification.

Cadmium was readily taken up from hydroponic solution by corn with toxicity symptoms being observed at cadmium concentrations as low as 1 ppm. Chlorosis, the initial symptom of cadmium toxicity, gave way to necrosis as length of treatment was extended, which correlated well with a decrease in chlorophyll content. In vivo respiration and ATP levels suggest that mitochondrial activity was adversely affected by low levels of cadmium. Electron micrographs of treated roots show abnormal mitochondria at low cadmium concentrations (approximately 2 ppm). Mitochondria isolated from 3-day-old etiolated corn shoots were also adversely affected by cadmium, exhibiting swelling, inhibition of substrate oxidation, and uncoupling of phosphorylation at low (one-half inhibition was generally less than .1 mM) cadmium concentrations. The binding of cadmium to membranes of isolated mitochondria was found to be similar to Zn(+2), having a greater affinity than Ni(+2), Mn(+2), or Co(+2), while the maximum number of binding sites was about the same for all 5 cations. (See also W75-05277) (Jerigan-Vanderbilt)
W75-05290

THE TOLERANCE OF STIGEOCLONIUM TENUE KUTZ. TO HEAVY METALS IN SOUTH WALES,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
R. O. McLean.
Br Phycol J. Vol 9, No 1, p 91-95. 1974, Illus.
Identifiers: *Cladophora-Glomerata, Copper, *Heavy metals, Iron, Lead, Manganese, Nutrition, *Stigeoclonium-Tenue, *Tolerance levels, *Wales, Zinc, Water pollution effects.

The distribution of S. tenue Kutz. and Cladophora glomerata Kutz. in relation to metal pollution by Cu, Pb, Fe, Zn and Mn was studied in 169 river stations in the spring months of 1972. Equal tolerance to Cu, Pb and Zn was demonstrated in both algae, but Stigeo-clonium showed greater tolerance to Fe, even in conditions of poor nutrient status.--Copyright 1974, Biological Abstracts, Inc.
W75-05336

PHOSPHORUS INPUTS AND ALGAL BLOOMS IN LAKES,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
R. W. Bachmann, and J. R. Jones.
Iowa State Journal of Research, Vol 49, No 2, Pt 1, p 155-160, 1974. 2 fig, 25 ref. OWRT A-049-IA(1).

Descriptors: *Phosphorus, *Eutrophication, *Lakes, Standing crops, Plankton, Algae, Secchi disks, Chlorophyll, *Iowa, Nitrogen, Rainfall, Tributaries, Sediments.
Identifiers: Lake West Okoboji(Iowa), Lake East Okoboji(Iowa), Spirit Lake(Iowa), Lower Gar Lake(Iowa).

Many lakes have high densities of plankton algae that reduce water transparency and degrade water quality. As an index of trophic status, the average concentrations of planktonic chlorophyll-a were measured in July and August in four lakes in northwestern Iowa during each of three years. Annual inputs of total phosphorus and inorganic nitrogen for each year were estimated by sampling the rainfall and the inputs of tributary streams. The annual inputs of each element were divided by the lake volumes to find the potential concentrations. The findings confirm that the trophic status of lakes is determined to a large extent by the annual inputs of phosphorus. Responses to changes in annual phosphorus input probably reflect the strong tendency for phosphorus to become bound in the sediments providing little carryover. The summer standing crops of plankton algae in a diverse group of lakes were significantly related to the annual inputs of total phosphorus divided by lake volumes. Based on the relationship between Secchi disk transparency and chlorophyll-a concentrations, phosphorus inputs would have to be reduced below about 0.02 mg/l before significant increases in water transparency would be achieved as a result of reduced algal standing crops. (Jones-Wisconsin)
W75-05337

MINIMUM INTERFERENCE BETWEEN PLANKTON SPECIES AND ITS BENEFICIAL EFFECT,
Woods Hole Oceanographic Institution, Mass.
E. M. Hulburt, and D. Horton.
Marine Biology, Vol 23, No 1, p 35-38, 1973. 1 fig, 2 tab, 10 ref. OWRT B-004-NC(14), 14-01-0001-1038.

Descriptors: *Phytoplankton, *Plant growth, *Competition, Biological communities, *North Carolina, Crop response, Growth rates, Productivity, Environmental effects, Mode of action.
Identifiers: *Pamlico Sound(NC).

Surveys were made in Pamlico Sound, North Carolina to observe conditions affecting phytoplankton growth. Close examination of the sequences of change reveals a roughly 10-fold fluctuation in the concentrations of both Peridinium triquetrum and Katodinium rotundatum. There was an equal division of biomass species. A similar sharing is indicated at other locations. Each species, with one exception, overlapped another or several others at locations of maximum abundance or maximum growth. This degree of overlap, with the severe restriction that it must be sought only where maximum growth obtains, seems considerable and indicates the manner in which each species benefited from a minimum of interference from other species. It is concluded that one group of phytoplankton species was not prevented from growing by the presence of a second group of species. The first group benefited from that which produced growth and from a minimum of interference with its growth. Minimum interference between species is further indicated by the sharing of the biomass by two species growing in unison, and by the overlapping distributions of species at their locations of maximum growth. (Jones-Wisconsin)
W75-05338

ECOLOGICAL EFFECTS OF NUCLEAR STEAM ELECTRIC STATION OPERATIONS ON ESTUARINE SYSTEMS, VOL. 2.
Maryland Univ., Prince Frederick. Natural Resources Inst.

Available from NTIS, Springfield, Va. 22161 as Rept. No. ORO-4328-2, $15.25 in paper copy, $2.25 in microfiche. Report No. ORO-4328-2, p 192-453, August 1973. 100 fig, 37 tab, 17 ref.

Descriptors: *Assessment, *Ecosystems, *Chesapeake Bay, Water Pollution, *Water pollution sources, *Nuclear powerplants, Effluents, Aquatic life, Benthic fauna, Benthic flora, Crabs, Fish, Model studies, Ecology, Water quality, Data collections, Sampling, Analytical techniques, *Maryland.
Identifiers: *Calvert Cliffs Site(Md).

An annual assessment is presented of the effects of the Calvert Cliffs Nuclear Powerplant on aquatic environment of Chesapeake Bay. Pre-operational and Post-operational data collections will be compared to properly assess the influence of the Calvert Cliffs plant on the aquatic life of Chesapeake Bay. Annual data are collected and reported for benthic annual-sediments, blue crab, finfish, ecosystem modeling, and field water quality data. (See W75-05343 thru W75-05346) (Houser-ORNL)
W75-05342

BENTHIC ANIMAL-SEDIMENT,
Maryland Univ., Prince Frederick. Natural Resources Inst.
For primary bibliographic entry see Field 5A.
W75-05343

BLUE CRAB SURVEY IN THE WATERS ADJACENT TO THE CALVERT CLIFFS NUCLEAR STEAM ELECTRIC STATION AND THE CHESAPEAKE BAY REGION,
Maryland Univ., Prince Frederick. Natural Resources Inst.
S. D. Sulkin, and R. E. Miller.
In: Report No ORO-4328-Vol 2, p 345-399, August 1973. 10 fig, 10 tab.

Descriptors: *Nuclear powerplants, Effluents, Environmental effects, Aquatic environment, *Sites, *Chesapeake Bay, Aquatic animals, *Crabs, Estuarine environment, Movement, Distribution, Dispersion, Temperature, Life cycles, *Maryland, Water pollution effects.
Identifiers: *Blue crabs, *Calvert Cliffs site(Md).

The blue crab program carried out off the Calvert Cliffs site at established transect stations is part of a larger study conducted within the Chesapeake Bay System. Recent data have modified concepts concerning blue crab movements and distribution. High wintering over densities of juvenile blue crabs in the Calvert Cliffs region occurred during the winter of 1969-70; however, during the winters of 1970-71 and 1971-72 the juvenile population was more dispersed. Apparently low temperatures are a limiting factor in halting dispersal. During the winter of 1969-70 a late movement may have occurred from the lower Bay and the timing with low temperatures halted the movement of a large number of juveniles in the Calvert Cliffs region. Movement of Juveniles from the lower Bay apparently began earlier in subsequent years and resulted in a more wide spread distribution in the Bay system before low limiting temperature prevailed. Thus, the Calvert Cliffs region is not a consistent wintering over area. The region does tend to support high densities of adult blue crabs, especially during the late summer and fall periods when large numbers of females are migrating south to the spawning grounds in the Bay mouth area. (See also W75-05342) (Houser-ORNL)
W75-05344

FISH SURVEY: OTHER TRAWL COLLECTIONS OFFSHORE OF THE CALVERT CLIFFS NUCLEAR POWERPLANT SITE,
Maryland Univ., Prince Frederick. Natural Resources Inst.
T. S. Y. Koo, and D. E. Ritchie, Jr.
In: Report No ORO-4328-2-Vol 2, p 400-420, August 1973. 9 tab.

Descriptors: *Surveys, Environmental effect, *Nuclear powerplants, Estuarine environment, Fish, *Fish behavior, *Chesapeake bay, Migration, Fish population, Seasonal, Distribution, Data collections, Operations, Ecosystems, Comparative productivity, Water pollution, *Maryland.
Identifiers: *Calvert Cliffs site(Md).

Bottom fishes in the vicinity of the Calvert Cliffs powerplant site, as well as their seasonal distribution and relative abundance were investigated. Larger invertebrates, such as crabs, shrimps, jellyfishes, that were caught incidental to fish species, were recorded also. With the accumulation of data over a span of several years, it is hoped a general picture of bottom fishes in the vicinity of the nuclear powerplant site may be established before the plant goes into operation. (See also W75-05342) (Houser-ORNL)
W75-05345

ECOSYSTEM MODELING: EFFECTS OF TEMPERATURE ON ESTUARINE MICROCOSMS,
Maryland Univ., Prince Frederick. Natural Resources Inst.
D. R. Heinle, D. A. Flemer, and R. E. Ulanowicz.
In: Report No ORO-4328-2-Vol 2, p 421-453, August 1973. 3 ref.

Descriptors: *Model studies, *Ecosystems, *Nuclear powerplants, Effluents, *Environmental effects, Aquatic environment, *Chesapeake Bay, Estuarine environment, Data collections, Water quality, Temperature, Salinity, Dissolved oxygen, Analytical techniques, Evaluation, Standards, Profiles, *Maryland.
Identifiers: Microcosms, *Calvert Cliffs Site(Md).

Progress in studies of estuarine microcosms is reported. Two types of structures for these studies have been developed; namely, rigid plexiglass cubes of 2 cu. m. volume and 750 liter polyethylene drums. Analytical methods involving a significant deviation from traditional methods of ecosystems modeling are reported. One experiment in which temperature was the major environmental variable was conducted. Water quality data from Calverts Cliffs are tabulated by cruise date as recorded in the field and are shown in Appendix A. Temperature, salinity, and oxygen data from routine seven station cruises are given. (See also W75-05342) (Houser-ORNL)
W75-05346

PUERTO RICO NUCLEAR CENTER, ANNUAL REPORT, 1973.
Puerto Rico Univ., San Juan.
For primary bibliographic entry see Field 5A.
W75-05350

5D. Waste Treatment Processes

CITY OF SPARKS, NEVADA, FEASIBILITY STUDY FOR SPANISH SPRINGS INTERCEPTOR,
Spink Corp., Reno, Nev.
Sparks Department of Public Works, Nevada, December 1972. 33 p, 5 fig, 9 tab, 6 ref.

Descriptors: *Planning, *Sewers, *Sewerage, *Interceptor sewers, *Nevada, Feasibility studies, Land use, Water requirements, Conveyance structures.
Identifiers: *Sparks(Nevada), Spanish Springs Valley, North Truckee Meadows.

The extent was studied of the sewerage facility needs for the North Truckee Meadows and Spanish Springs Valley along with the most feasible alternative for providing these requirements. The facilities to be constructed must be consistent with a program for a coordinated areawide water and sewer system as part of the comprehensive planned development of the area. Information has been obtained on the limits of the area to be served, population projections, land use, water consumption and use, topography, underground conditions, per capita sewage contributions, alternative conveyance systems, design, cost and present economic and analysis recommendations. The 1970 census indicates that the Sparks area increased 47% in population over the last ten years. A two-part approach is made to determine requirements: the first part would consist of an analysis of sewage contribution within the existing system and; the second part of the analysis would be applied to the study areas which had a smaller planned land use. Two alternative phases are also presented: phase one would start construction from the present (1973) to that time when existing facilities have reached their design capacity (20 years was assumed with the intention of servicing only the Truckee Meadow area); phase two would involve a second stage of interceptor construction at a future date to provide service to Spanish Springs Valley. (Poertner)
W75-04863

REPORT TO THE GOVERNOR AND THE LEGISLATIVE COMMISSION FINAL ALTERNATE PLAN, LAS VEGAS WASH/BAY POLLUTION ABATEMENT PROJECT,
Clark County Board of County Commissioners, Nev.
July 1974. 33 p, 2 fig, 1 tab, 10 append.

Descriptors: *Lake basins, *Reclaimed water, *Water reuse, *Monitoring, *Nevada, *Pollution abatement, Water pollution control, Abatement, Groundwater resources, Salinity.
Identifiers: *Lake Mead, *Saline groundwater collection, Clark County(Nevada), Las Vegas(Nevada).

Clark County, Nevada's six-point plan to abate pollution of Lake Mead is described. The plan covers: (1) advanced wastewater treatment, (2) beneficial use of reclaimed water, (3) cooperation with developers of the saline groundwater collection system, (4) recreational potential of Las Vegas Wash/Bay, (5) market potential for the sale of reclaimed water, and (6) a monitoring program for Las Vegas Wash/Bay. Areawide salinity control is under investigation. On June 6, 1974, Clark County received a grant offer for $1,287,885 from the Environmental Protection Agency which represents an extremely significant funding milestone for the pollution abatement project. Another aspect of this investigation will determine if remote sensing devices can be used to measure chlorophyll concentrations. Three consultants have been retained to develop, plan and execute a continuing water quality monitoring program for Lake Mead. The report includes three documents which describe the proposed salinity control investigation; these are: (1) a parent document providing non-technical information relating to the recent history of the pollution abatement project and a description of alternative recommendations, (2) a Facilities Plan prepared by Nevada Environmental Consultants, and (3) an addendum to the Environmental Assessment prepared by VTN/Jones and Stokes. (Poertner)
W75-04868

TRAINING MANUAL ON THE BASIC TECHNOLOGY OF THE PULP AND PAPER INDUSTRY AND ITS WASTE REDUCTION PRACTICES,
Lakehead Univ., Thunder Bay (Ontario).
A. J. Bruley.
Environment Canada, Environment Protection Service Water Pollution Control Directorate, Training Manual Environment Protection Services, 6-WP-74-3, Ottawa, Ontario, Canada, August, 1974, 140 p, 11 ref, 60 fig, 13 tab.

Descriptors: *Pulp and paper industry, *Waste treatment, *Training, *Water pollution sources, Pollution abatement, Technology, Education, Effluents, Bleaching wastes, Equipment, Water quality control.
Identifiers: Kraft mills, Manuals.

This manual is intended for the use of Environmental Protection Service personnel whose responsibilities include surveillance of effluents from pulp and paper mills. It provides a basic review of the pulp and paper technology with emphasis on sources of pollution within the industry. The main processes are described and any polluting effluents are noted. Waste reduction practices such as reuse of processed water and waste treatment are also delta with. A bibliography and a glossary of pulp and paper terminology are included. (Environment Canada)
W75-04871

ECONOMIC AND FINANCIAL ASPECTS OF WASTEWATER TREATMENT IN THE ST. FRANCOIS RIVER BASIN, QUEBEC - A PRELIMINARY ANALYSIS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
D. M. Tate.
Water Planning and Management Branch, Social Science Series No 4, 1974, 30 p, 1 fig, 62 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp wastes, *Costs, Pollution abatement, Water pollution sources, Treatment facilities, Water quality control, Domestic wastes, Planning, *Canada.
Identifiers: *Economic aspects, *St. Francois River Basin(Canada).

Water pollution problems in the St. Francois River Basin of Quebec are examined and the existing pollution sources and treatment facilities are described. Pulp and paper mills are a main source of industrial wastes. Waste treatment facilities are judged completely inadequate. The costs of providing adequate waste treatment are estimated for both industrial and municipal effluents. Costs of financing such facilities are also estimated. Recommendations for treatment priorities are included. (Environment Canada)
W75-04872

PHOSPHORUS REMOVAL DEMONSTRATION STUDIED AT C.F.B. TRENTON,
Environmental Protection Service, Ottawa (Ontario).
W. E. Stepko, and E. E. Shannon.
Environment Canada, Environmental Protection Service, Water Pollution Control, Technical Development Report, EPS 4-WP-74-9, Ottawa, Ontario, September 1974, 35 p, 7 ref, 13 fig, 12 tables.

Descriptors: *Detergents, *Phosphorus, *Activated sludge, *Nutrient removal, Nutrients, *Waste water treatment, Monitoring, Water quality, Pollution abatement, Testing procedures, Effluents, Costs, *Canada.
Identifiers: Trenton(Canada), Ontario, *Alum treatment.

Full scale phosphorus removal studies, employing alum addition to an activated sludge treatment plant, were conducted at C.F.B. Trenton. Treatment plant performance with respect to BOD5 total phosphorus, and suspended solids removals was closely monitored under baseline (no chemical addition) conditions and at various alum addition levels. Secondary effects of the alum additions were also observed. The required alum dosage for phosphorus removal was 3.0 to 3.5 mg/l as Al and the most effective addition point was at the exit end of the aeration basins. Alum additions improved suspended solids removal efficiencies and maintained BOD5 and turbidity removal efficiencies at baseline levels. A residual phosphorus removal effect was observed during periods of zero alum additons (including baseline). An in-depth investigation of the effect was recommended to determine if phosphorus removal requirements can be met at reduced alum dosages. Because of inadequate digester capacity and poor digester supernatant quality, 70% of the phosphorus removed from the plant in the raw sludge eventually recycled back to the primary clarifier. To alleviate this problem it was recommended that a second digestion stage be added to the plant. (Environment Canada)
W75-04878

FULL SCALE PHOSPHORUS REMOVAL STUDIES AT C.F.B. PETAWAWA,
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Centre.
E. E. Shannon, J. M. Salvo, and B. R. Burns.
Technology Development Report EPS 4-WP-74-3, 45 p, 11 tab, 16 fig, 11 ref, April, 1974, Environmental Protection Service, Environment Canada, Ottawa, Ontario, Canada.

Descriptors: *Phosphorus, *Monitoring, Investigations, Research and development, Facilities, Treatment facilities, *Waste water treatment, Testing, Analytical techniques, Methodology, *Nutrient removal, *Canada.
Identifiers: Petawawa(Ontario-Canada).

Full-scale phosphorus removal studies, employing alum addition to the primary wastewater treatment plant, were conducted at C.F.B. Petawawa. Plant efficiency with respect to BOD, total phosphorus and suspended solids removals was closely monitored. Secondary effects of the alum additions were also observed. Comparisons were made between jar test predictions and full-scale phosphorus removal. In order to assess potential effects of the alum sludge on anaerobic digestion, the digester performance was closely monitored during the phosphorus removal program. The optimum alum dosage for phosphorus removal was 12.5 mg/l as Al. With rectification of existing hydraulic problems, the plant should consistently produce an effluent of 1 mg/l total P or less. Alum additions improved BOD, suspended solids and turbidity removal efficiencies. Alum addition also incurred a two-fold increase in the volatile solids loading to the anaerobic digester resulting in an eventual digester failure. To alleviate future digester problems, stepwise alum additions were recommended in order to acclimate the digester to the increased loadings. (Environment Canada)
W75-04879

CHELANT TREATMENTS PROVIDE MAXIMUM RETURN TO THE PULP AND PAPER INDUSTRY,
Betz Lab., Inc., Trevose, Pa.
For primary bibliographic entry see Field 5F.
W75-04940

WATER TREATMENT WITH ACTIVATED CARBON MADE FROM SLUDGE AND WASTE PAPER,
Institute of Paper Chemistry, Appleton, Wis.
R. Maematsu.
Japan Pulp and Paper, Vol 12, No 3, p 53-58, Oct. 1974. 5 fig, 2 tab.

Descriptors: *Activated carbon, *Sludge, *Waste water treatment, Governments, Foreign countries, Effluents, Industrial wastes, Water purification, Color, Chemical oxygen demand, Pulp wastes, Pollution abatement, Water pollution sources, Pulp and paper industry, Sludge disposal, Waste disposal.
Identifiers: *Waste paper, *Japan.

Government pressures on Japanese industries to reduce the color and BOD of effleunts have generated studies in activated carbon treatment, and in developing sources of this material. Some actions directed at producing activated carbon from certain industrial waste sludge streams (such as pulp and paper mill sludge) and from waste papers not suitable for recycling as secondary fiber are discussed. (Hansen-IPC)
W75-04941

EFFLUENT TOXICITY REMOVAL ON THE WEST COAST,
B.C. Research Ltd., Vancouver.
C. C. Walden, and T. E. Howard.
Pulp and Paper Canada, Vol 75, No 11, p 88-92 (T370-374), Nov 1974. 6 tab, 20 ref.

Descriptors: *Biological treatment, *Pulp wastes, *Sulfite liquors, *Waste water treatment, *Toxicity, Performance, Activated sludge, Aerated lagoons, Ammonia, Surveys, Water pollution sources, Industrial wastes, Bioassay, Biochemical oxygen demand, Hydrogen ion concentration, Effluents, Waste treatment, Water pollution control, Water quality, Canada, United States, Pulp and paper industry.
Identifiers: Zinc hydrosulfite(Dithionite), Kraft mills, Sulfite mills, Black liquors.

The performance of 14 pulp and paper mills in the provinces of British Columbia and Alberta and in the states of Washington, Oregon, and California in detoxifying effluents was surveyed. The frequency of successful detoxification was assessed at 80% for aerated stabilization basins and 70% for activated sludge systems. The poorer performance of the latter was attrubited to low operating sludge levels in the biobasins. For a number of mills, available bioassay data could not be interrelated with mill operating experience. In certain instances, the lack of biotreatability was attributed to black liquor spills, pH variations, woodroom effluent, and to the presence of waste zinc hydrosulfite. The potential toxicity of ammonia entering biotreatment systems, from ammonia-base sulfite operations, is discussed. (Hansen-IPC)
W75-04942

EXPECTATIONS FOR THE CLOSED WATER SYSTEM AND COST COMPARISON WITH EFFLUENT PURIFICATION (DIE ERWARTUNGEN AND DEN GESCHLOSSENEN WASSERKREISLAUF IM KOSTENVERGLEICH ZUR ABWASSERREINIGUNG),
Krofta Apparatebau (Gesellschaft) (West Germany).
E. Hurst-Gaul.
Wochenblatt fur Papierfabrikation, Vol 102, No 16, p 591-593, August 31, 1974.

Descriptors: *Waste water treatment, *Water conservation, *Cost comparisons, *Benefits, *Biological treatment, *Water reuse, Waste treatment, Pulp and paper industry, Costs, Recirculated water, Industrial water, Biochemical oxygen demand, Slime, Energy, Corrosion, Water purification, Reclaimed water, Pulp wastes, Closed conduits.
Identifiers: *Closed systems, White water(Paper machine).

A closed water circulation system costs only a fraction of the cost of biological purification of effluents, which shows every indication of rising still higher. The closed system requires careful planning to keep production undisturbed and prevent salting out or corrosion. The increase in BOD does not interfere with papermaking. Other advantages are control of slime and better raw material and energy utilization. Problems with special papers, which are still unsolved, are discussed. (Ward-IPC)
W75-04944

HANDBOOK OF ENVIRONMENTAL CONTROL. (1) AIR POLLUTION. (2) SOLID WASTE. (3) WATER SUPPLY AND TREATMENT. (4)

WASTEWATER: TREATMENT AND DISPOSAL,
Minnesota Univ., Minne. Div. of Environmental Health.
CRC Press (Division of the Chemical Rubber Company, Cleveland, Ohio, 1972-1974. Vol 1: 576 p. Vol 2: 580 p. Vol 3: 835 p. Vol 4: 905 p. Bond, R. G., Straub, C. P., and Prober, R., editors.

Descriptors: *Environmental control, *Air pollution, *Solid wastes, *Water supply, *Water treatment, *Waste water treatment, *Waste water disposal, Wastes, Monitoring, Disposal, Effluents, Pollutant identification, Atmosphere, Air pollution effects, Control systems, Control, Ultimate disposal, Water pollution sources, Management, Water quality, Biological properties, Analytical techniques, Municipal wastes, Sewage, Industrial wastes, Natural streams, Oxygen, Eutrophication.

These four volumes give compilations of data needed for the detection, monitoring, handling, and control of air- and water-borne contaminants, the treatment and disposal of solid wastes, and the processing and treatment of aqueous and atmospheric effluents. (Brown-IPC)
W75-04945

SYSTEM CLOSURE IN RHEMSPRINGE (KREISLAUFSCHLIESSUNG IN RHUMSPRINGE),
Harzer Papierfabrik Sievers G.m.b.H. and Co. KG, Rhumspringe (West Germany).
K. Hommel.
Wochenblatt fur Papierfabrikation, Vol 102, No 16, p 590-591, August 31, 1974.

Descriptors: *Pulp and paper industry, *Water reuse, *Reclaimed water, Industrial wastes, Effluents, Recirculated water, Slime, Odor, Corrosion, Hydrogen sulfide, Anaerobic digestion, Water treatment, Sulfates, Water pollution control, Water pollution sources, Pulp wastes, Closed conduits, Water conservation.
Identifiers: *Closed systems, White water(Paper machine), *West Germany(Rhumspringe).

In 1968 Harzer Papierfabrik Sievers GmbH joined the Rhumspringe community in a joint venture for biological clarifion of effluents. This was unsatisfactory, and since 1972 the mill has been operating with a closed system. Production has not suffered, and there have been no problems with salting out, slime, or odors. There have been corrosion problems caused by hydrogen sulfide, arising from anaerobic breakdown of sulfates. At present, the sulfate content of the plant water is being reduced with barium carbonate, but the problem is still under study. (Ward-IPC)
W75-04947

CARBON AND COLOR DISTRIBUTION IN VARIOUS SIZE FRACTIONS OF TREATED PULP MILL AND BOARD MILL WASTE EFFLUENTS,
Saskatchewan Univ., Dept. of Civil Engineering. Saskatoon.
For primary bibliographic entry see Field 5B.
W75-04948

INTRODUCTION OF THE ATTISHOLZ PROCESS INTO PAPER MILLS AND SOME RESULTING EXPERIENCES (EINSATZ DES VERFAHRENS ATTISHOLZ IN PAPIEROFABRIKEN UND DARAUS RESULTIERENDE ERFAHRUNGEN),
Cellulose Attisholz A.G., Luterbach (Switzerland).
K. Geiger.
Wochenblatt fur Papierfabrikation, Vol 102, No 16, p 593-594, August 31, 1974.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated sludge, *Pulp wastes, Biological treatment, Industrial wastes, Waste treatment, Europe, Wisconsin, Operating costs, Costs, Effluents, Sludge, Foreign countries, United States, Pulp and paper industry, Water pollution sources, Water pollution control, North America.
Identifiers: *Attisholz process.

The Attisholz system for biological purification is a two-stage activated sludge process. It advantages, high effectiveness, low operating cost, and low yield of clarification sludge, are discussed in relation to the experiences of three mills now using the process: the Biberist and Utzenstorf mills in Europe and Wisconsin Tissue Mills in the United States. Whether a biological process would be of much help, since salting out would still present problems is discussed. (Ward-IPC)
W75-04951

ACTIVATED CARBON PROVES TO BE EFFECTIVE IN REMOVING TOXICITY,
Beak (T.W.) Consultants Ltd., Montreal (Quebec).
M. Wasserlauf.
Canadian Pulp and Paper Industry, Vol 27, No 11, p 33-37, Nov 1974. 8 fig, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, *Activated carbon, *Waste water treatment, Pilot plants, *Canada, Foreign countries, Wastes, Industrial wastes, Waste treatment, Solids contact processes, Tertiary treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Color, Hydrogen ion concentration, Suspended solids, Effluents, Industrial wastes, Water pollution treatment, Water purification, Bioassay, Water analysis.
Identifiers: Kraft mills.

The results are presented of a 2.5-month pilot plant study conducted at an eastern Canadian kraft mill on the feasibility of detoxifying pulp mill effluents with activated carbon. The mill produces bleached, semibleached, and unbleached kraft pulps from a combination of 90% softwood (mostly spruce and fir) and 10% hardwood. Mill effluents received primary treatment in a clarifier and secondary treatment in a two-stage aerated lagoon. The pilot plant is briefly described. Water quality tests were performed on influent and effluent from composite tanks and from the four activated carbon columns to determine BOD, COD, color, pH, and suspended solids. Bioassays were conducted to evaluate the toxicity removal. The results showed that activated carbon is effective in detoxifying kraft mill effluents. Despite solids concentrations as high as 200 mg/liter in the pilot-plant influent, there were not problems with plugging in the columns, and no need for prefiltering of solids. A contact time of 15 minutes was adequate for reducing toxicity to acceptable levels. The high concentration of kraft mill effluents precludes the use of carbon by itself for removal of either color or BOD. While high removals of both color and BOD were attained during the initial two to three days of operation with fresh carbon, the average removal attained was approximately 40% for 5-day BOD and 57% for color. On a per unit basis, activated carbon removed 0.0625 g BOD and 180 color units per gram of carbon used. (Witt-IPC)
W75-04953

KRAFT EFFLUENT COLOR REMOVAL BY DISPERSED AIR FLOTATION,
Saint Mary's Univ., Halifax (Nova Scotia).
E. R. Hayes, and V. G. Munroe.
Pulp and Paper Canada, Vol 75, No 11, p 61-64 (T398-401), Nov 1974. 7 fig, 2 tab, 24 ref.

Descriptors: *Color, *Pulp wastes, *Waste water treatment, *Flotation, Polyelectrolytes, Industrial wastes, Water pollution sources, Effluents, Biochemical oxygen demand, Chemical oxygen demand, Flocculation, Coagulation, Sedimentation, Aluminum, Sulfates, Water pollution treatment, Waste treatment, Water pollution control, Water purification, Costs, Pulp and paper industry.
Identifiers: Kraft mills, Alums.

An alum solution and a synthetic high molecular weight polyelectrolyte flocculant aid were added to kraft mill effluent. The sample was tested to determine float volume, floc size, and flotation time. Float was removed by aspiration, and the treated effluent was filtered. A dispersed air flotation system provided faster formation and separation of the float. A miniplant designed on the above principle was assembled and operated at Scott Maritimes Pulp Ltd. The color of the effleunt discharged from the pilot plant was comparable to results in the laboratory studies, in which 90% of the color was removed, and the BOD and COD were reduced 45% and 65%, respectively. Approximate costs for the operation are projected, and two methods of alum recovery are suggested. (Sykes-IPC)
W75-04954

'FLOAT WASH' -- A CLOSING-UP SYSTEM FOR THE PULP AND PAPER INDUSTRY,
Fractionator, Stockholm (Sweden). Aktiebolaget.
M. Holmrich.
Paper, Vol 182, No 8, p 500-502, Oct 16, 1974. 4 fig.

Descriptors: *Water purification, *Industrial water, *Water conservation, *Pulp wastes, *Treatment facilities, Equipment, Screens, Water treatment, Separation techniques, *Waste water treatment, Reclaimed water, Sludge treatment, Water pollution control, Pollution abatement, Recycling, Waste treatment, Industrial wastes.
Identifiers: *Float Wash Fractionator, Deinking, Fiber recovery.

The Float Wash Fractionator, developed by AB Fractionator, Stockholm, Sweden, involves fractionating against a liquid column. The water to be treated, formed to a full cone jet by a nozzle, is sprayed upwards towards a screen. The fines fraction, which is the passed fraction, forms a liquid column on the upper side of the screen. The coarse fraction, containing pure fibers, falls from the screen into the lower tank. In some applications, the fines fraction is used as fourdrinier wire shower water and the coarse fraction returns to production. In a deinking system the fines fraction is passed to a flotation system and the coarse fraction goes to a washing filter. Other applications include: separation of fibers from sludge, microscreening of water, preparation of precoat for filters, fractionating of pulp, or in combination with existing flotation systems. (Sykes-IPC)
W75-04955

WATER CONSERVATION AND FIBER ECONOMY,
Thames Board Mills Ltd., Purfleet (England).
For primary bibliographic entry see Field 3E.
W75-04956

HOW TO CLARIFY KRAFT EFFLUENT WITH SEAWATER AND LIME,
Nova Scotia Research Foundation, Dartmouth.
B. Rapson, D. P. Sullivan, and J. A. Brothers.
Pulp and Paper Canada, Vol 76, No 1, p 88-91 (T21-23), Jan 1975. 9 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Color, *Suspended solids, *Sea water, *Lime, Effluents, Aeration, Bicarbonates, Carbon dioxide, Magnesium, Oxides, Calcium, Flocculation, Water pollution sources, Industrial wastes, Operating costs, Costs, Waste treatment, Separation techniques, Pulp and paper industry.
Identifiers: Kraft mills.

A novel and efficient process is described for removing color and suspended solids from kraft mill effluents. In this process, developed at Nova

Scotia Research Foundation, a small amount (5-10%) of seawater is first added to the combined mill effluents, and the mixture is aerated to removed bicarbonates as carbon dioxide. This is followed by the addition of only slightly more than the stoichiometric amount of lime to produce a flocculant precipitate of MgO which, as it settles, removes color and suspended solids. Over 80% color removal has been achieved in the laboratory with lime additions as small as 250 mg CaO/liter. An unexpected finding was the relatively high floc settling rate, up to 4 ft/hr, obtained with small lime additions. This could lead to appreciably smaller clarifiers than those required in more conventional processes. Figures are presented showing a preliminary estimate of $5.00/ton of pulp for the direct operating costs of large-scale facilities based on this process. The process also offers the prospect of reduction of operating cost by recovering and selling MgO. A possible method of recovering MgO is described. (Hansen-IPC)
W75-04958

CALCULATION OF CONCENTRATION OF IMPURITIES IN THE RECYCLING SYSTEM OF PROCESS WATER IN KRAFT PULP MANUFACTURE (BERECHNUNG DER VERUNREINIGUNGSKONZENTRATION IM REZIRKULATIONS SYSTEM DER BETRIEBSWAESSER BEI DER SULFATZELLSTOFFHERSTELLUNG),
IRAPA, Prague (Czechoslovakia).
F. Minarik, and P. Sochan.
Zellstoff and und Papier, Vol 23, No 9, p 260-267, Sept 1974. 1 fig.

Descriptors: *Recirculated water, *Water quality, *Bleaching wastes, *Pulp wastes, Flow system, *Mathematical models, Model studies, Computers, Simulation analysis, *Recycling, Industrial water, Analytical techniques, *Water reuse, Waste water treatment.
Identifiers: *Kraft pulping, Chemical recovery, Black liquor.

The manufacture of kraft pulp is analyzed and a circuit diagram of the process is prepared, including recovery of chemicals, bleaching, and drying. A mathematical model is derived from this; calculation by the computer permits prediction of the efficacy of recycling, the quality of the return water, and the possibility of its repeated use without impairing pulp quality. (Ward-IPC)
W75-04959

WATER RECYCLING IN THE MANUFACTURE OF SIZED PAPERS (ISPOL'ZOVANIE OBOROTNYKH VOD V PROIZVODSTVE KLEENYKH VIDOV BUMAGI),
Belorusskii Tekhologicheskii Institut, Minsk (USSR).
V. L. Kolesnikov.
Bumazhnaya Promyshlennost', No 10, p 8-11, October, 1974. 2 fig, 1 tab.

Descriptors: *Water reuse, *Pulp and paper industry, *Water conservation, *Recirculated water, *Industrial water, *Reclaimed water, Effluents, Water pollution control, Water treatment, Waste water treatment, Demineralization, Water purification, Economics, Freshwater, Slime, Corrosion, Scaling, Suspended solids, Fibers(Plant), Water pollution sources, Acidic water, Inorganic compounds, Salts, Aluminum, Chemical precipitation, Coagulation.
Identifiers: White water(Paper machine), Sized papers, Alums, Rosin.

Most effluent recycling systems in the papermaking process take into account factors limiting the extent to which freshwater can be replaced by recycled water, such as slime formation, equipment corrosion, scale formation on heat exchangers, and wire and felt clogging. It is also widely recognized that repeated use of effluents requires the removal of fibers and other suspended particles. Insufficient attention has been given to the recycling of acidic water containing a aluminum salts. Diluation of papermaking stock with this water causes the formation of an undesirable coarse precipitate. Neutralization of the acidic water does not solve the problem, as aluminum compounds have a strong coagulating action even in neutral medium. Successful recycling in the manufacture of sized papers can be achieved only if inorganic compounds, primarily aluminum compounds, are removed from the white water prior to its use for stock diluation. A detailed description and diagram are given of a closed system developed for the manufacture of sized papers, in which freshwater is used only to make losses, and water consumption is only 1.6 cu m/ton of paper. The system, which includes stock preparation and papermaking operations, has three recycling circuits. A novel component is a unit for demineralization of white water and preparation of process water, in which the maximum permissible amount of untreated white water is mixed with purified white water and a certain amount of freshwater for compensation of losses. The system is economical and gives savings in rosin size of 5.3 kg/ton of product. (Stapinski-IPC)
W75-04960

REDUCTION OF FRESHWATER CONSUMPTION AT A BOARD MILL (OPYT L'VOVSKOI KARTONNOI FABRIKI PO SNIZHENNYU RASKHODA SVEZHEI VODY),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
V. P. Svitel'skii, A. D. Mil'shtein, V. A. Kovba, E. T. Mil'shtein, and T. D. Sokirko.
Bumazhnaya Promyshlennost', No 9, p 26-27, September, 1974. 1 tab.

Descriptors: Freshwater, *Pulp and paper industry, *Water consumption(Except consumptive use), *Water reuse, *Industrial water, Effluents, Water pollution control, Water pollution sources, Suspended solids, Microorganisms, Fibers(Plant), Recirculated water, Colloids, Water conservation, Waste water treatment.
Identifiers: White water(Paper machine).

The Lvov board mill manufactures solid fiber board from waste paper stock and lined board from a base layer of waste paper stock plus a liner of bleached chemical pulp. The freshwater consumption is 13 and 24 cu m/ton, respectively. This low consumption is due to the reuse of mechanically purified effluents for washing felts and cylinder molds, and as pump sealants. A large part of the felt wash water is discharged into the saveall of the solid-board machine. The pollution load of effluents increases with the advance of the web on the machine from the wet end to the presses. The processing of low-grade fibrous material under conditions of low freshwater consumption and reuse of insufficiently purified effluents resulted in the accumulation of highly dispersed solids, solloidal particles, and microorganisms in the system. This in turn caused excessive clogging of felts and shortening of their service life, deterioration of the pulp quality, poor dewatering, and web breaks. It was recommended that the felt wash water be separated from white water, that white water containing good quality fibers be used for stock dilution, and that all effluents that cannot be reused without purification be discharged. The introduction of these measures increased the recovery of fibers and halved the volume of effluents and their suspended solids content. (Stapinski-IPC)
W75-04961

DISINFECTION OF WHITE WATER WITH OZONE (OBREZZARAZHIVANIE OBOROTNOI VODY OZONOM),
Tsentralnyi Nauchno-Issledovatelskii Institut Bumagi, Moscow (USSR).
P. N. Fisher, E. A. Morkovina, Z. G. Oleneva, V. V. Sergeeva, and L. G. Loginova.
Bumazhnaya Promyshlennost', No 10, p 11, Oct, 1974. 1 tab.

Descriptors: *Ozone, *Disinfection, *Pulp wastes, *Waste water treatment, Microorganisms, Bacteria, Water purification, Water quality control, Water pollution sources, Water pollution control, Pulp and paper industry, Temperature, Industrial wastes, Waste treatment, Fibers(Plant), Aquatic bacteria, Aquatic microorganisms.
Identifiers: *White water(Paper machine).

White water from two paper mills (at Kondopoga and Solikamsk) was treated with ozone at various doses, temperatures, and for varying times. At an ozone dose of 3.5-4 kg/100 cu m water and a contact time of 7-10 minutes, all microorganisms were killed with the exception of bacterial spores. These can be destroyed after germination by a subsequent ozonization. The recommended treatment temperature is 45 C. (Stapinski-IPC)
W75-04962

REMOVAL OF DYES FROM PAPER MILL EFFLUENTS THROUGH TREATMENT BY THE FLYGTOL PROCESS (FARBSTOFF-ENTFERNUNG AUS PAPIERFABRIKSABWAESSERN DURCH DIE BEHANDLUNG MIT DEM FLYGTOL VERFAHREN),
C. H. Mobius, and T. H. Gunther.
Wochenblatt fur Papierfabrikation, Vol 102, No 15, p 559-561, August 15, 1974. 1 fig, 1 tab, 6 ref.

Descriptors: *Pulp wastes, *Dyes, *Color, *Waste water treatment, Bentonite, Montmorillonite, Clays, Cation exchange, Ion exchange, Effluents, Industrial wastes, Separation techniques, Water pollution sources, Water pollution control, Waste treatment.
Identifiers: *Flygtol process.

Using three different sets of conditions, it was found that the Flygtol process almost completely removes basic dyes, but removes only a small fraction of most acid dyes. This is explained by the physical and chemical properties of the active agent, Flygtol A (effluent bentonite), which contains montmorillonite in its especially active sodium form. This material not only has a high specific surface, but also a high cation exchange capacity. (Ward-IPC)
W75-04963

THE CHEMICAL TREATMENT OF COOLING WATER,
Standard Oil Co. of California, San Francisco.
J. W. McCoy.
Chemical Publishing Company (New York), 1974. 237 p.

Descriptors: *Cooling water, *Pre-treatment(Water), *Industrial water, *Cooling towers, *Wastewater treatment, Design, Operations, Corrosion, Scaling, Fouling, Microbiology, Chemicals, Chemical engineering, Chemical degradation, Chemical reactions, Management, Operation and maintenance, Water reuse, Recirculated water, Control, Analysis.
Identifiers: Corrosion inhibitors, Scale inhibitors, Chemical treatment.

The design and operating principles and practices of open recirculating cooling water systems are discussed, with emphasis on causes, analysis, and control of corrosion, scaling, fouling, microbiological deposits. The proper application of corrosion and scale inhibitors and other water treatment chemicals is dealt with from the viewpoints of chemists, chemical engineers, and managers/administrators of water treatment programs. Citations to the pertinent literature are appended to each chapter. An index is included. (Brown-IPC)
W75-04964

STUDY OF EFFLUENT DISCHARGE (K VOPROSU ISSLEDOVANIYA REZHINOV VODOOTVENDENIYA),
For primary bibliographic entry see Field 5G.

W75-04965

PURIFICATION OF THE PULP INDUSTRY'S BLEACHERY EFFLUENTS WITH ALUMINA (REINIGUNG VON BLEICHEREIABIWESSERN DER ZELLSTOFFINDUSTRIE MIT ALUMINIUMOXID),
T. Ploetz.
Das Papier, Vol 28, No 10A, p V39-V43, Oct, 1974. 3 fig, 1 ref.

Descriptors: *Bleaching wastes, Water purification, *Aluminum, *Oxides, *Pulp wastes, *Adsorption, Water pollution sources, Industrial wastes, *Waste water treatment, Waste treatment, Pulp and paper industry, Treatment facilities, Water pollution control, Europe, Foreign countries, Water quality standards, Water quality control, Pilot plants, Biological treatment, Flocculation, Oxidation, Filtration, Electrochemistry, Radiation, Radioactivity, Ozone, Activated carbon, Calcium, Iron, Salts.

The requirements for water protection set up in 1967 by the International Commission for the Protection of Water at Lake Constance proved too stringent for the bleachery effluents of Feldmuehle AG. sulfite pulp mill at Baienfurt. Purification methods investigated were biological processes, both single- and multistage; flocculation with calcium, iron, and aluminum salts, alone and in combination; catalytic oxidation; ultrafiltration; electrochemical methods; radioactive irradiation; ozonization; and adsorption on activated charcoal. The development of a new method involving adsorption on alumina is reported. It has been operating in the pilot-plant stage for several months. (Ward-IPC)
W75-04966

INDUSTRIAL WATER PURIFICATION,
L. F. Martin.
Noyes Data Corporation (Park Ridge, New Jersey and London), 1974. 300 p.

Descriptors: *Industrial wastes, *Patents, Water purification, *Reviews, *Separation techniques, United States, Publications, *Waste water treatment, Flocculation, Filtration, Absorption, Electrolysis, Ultrasonics, Metals, Oil wastes, Sulfite liquors, Pulp and paper industry, Color, Water pollution sources, Pollutants, Waste treatment, Chemical precipitation, Wastes, Water pollution, Water pollution control, Water pollution treatment, Fertilizers, Paints, Photography, Pulp wastes.

Based on a review of the United States patent literature (about 165 patents), a discussion is presented of solid-liquid and oil-water separation processes and equipment (flocculation, filtration, absorbents, electrolysis, ultrasonic and other treatments) in general. Specific reference is made to the separation of metals, metal finishing, refinery operations, coal and ore processing, spent liquor and effluent treatments in the pulp and paper industry, including color removal, and miscellaneous chemical processes used in the fertilizer, paint, photographic, and other industries. (Brown-IPC)
W75-04968

INCINERATION OF SOLID WASTES,
For primary bibliographic entry see Field 5E.
W75-04969

CHEMICAL TREATMENT OF PULP MILL EFFLUENTS. USE OF ASH FROM COMBUSTION OF BISULFATE LIQUOR (TRAITEMENT CHIMIQUE D'EFFLUENTS D'USINESS DE PATE. UTILISATION DES CENDRES DE COMBUSTION DE LIQUEUR BISULFITIQUE),
Finnish Pulp and Paper Research Inst., Helsinki.
E. Meloni.
ATIP (Association Technique de l'Industrie Papetiere) Revue, Vol 28, No 7, p 323-328, 1974. 1 fig, 11 tab, 14 ref.

Descriptors: *Sulfite liquors, *Fly ash, *Effluents, *Pulp and paper industry, *Waste treatment, Chemical precipitation, Chemical oxygen demand, Color, Bleaching wastes, Industrial wastes, Water pollution sources, Biochemical oxygen demand, Suspended solids, Nutrients, *Waste water treatment, Water pollution treatment, Sludge, Sludge treatment, Hydrogen ion concentration, Dissolved solids, Foreign countries, Europe, Incineration, Lime.
Identifiers: Barking effluents, *Finland.

Following a brief review of methods of chemical treatment of pulp mill effluents in various countries, especially in Finland, studies are presented concerning the use of fly ash from combustion of calcium bisulfite spent pulping liquors in treating pulp mill effluents. Results were generally found to improve with increasing amounts of fly ash used; 1-5 g/liter can be considered as sufficient. The use of fly ash appears to be best suited to treating barking (woodroom) effluents. It is also useful in decreasing the COD and color of pulp washing and bleaching effluents, but does not significantly affect BOD or contents of suspended materials and nutrients. The fly ash is comparable or superior to lime for chemical effluent treatment. Sludge volumes produced are higher than in mechanical treatment, but sludge filtration is much easier in many cases. The main disadvantages of the treatment are the high pH and content of dissolved materials in the treated effluents. (Speckhard-IPC)
W75-04973

INVESTIGATIONS ON TREATMENT OF PAPER AND PULP EFFLUENTS BY THE RUTHNER RAPID CLARIFICATION SYSTEM (UNTERSUCHUNGEN ZUR AUFBEREITUNG VON PAPIER-UND ZELLSTOFFABWAESSERN MITTELS SCHNELLKLAERER SYSTEM RUTHNER),
W. Lutz.
Das Oesterreichische Papier, Vol 11, No 7, p 9-15, July 1974. 4 fig.

Descriptors: *Treatment facilities, *Pulp wastes, Water purification, Waste treatment, *Coagulation, *Flocculation, Silica, Inorganic compounds, Organic compounds, Cellulose, Cations, Anions, Ions, Chemical reactions, Chemicals, Separation techniques, Industrial wastes, Water pollution sources, Sulfite liquors, Water pollution treatment, Effluents, *Waste water treatment, Polyelectrolytes, Additives, Carbohydrates.
Identifiers: *Ruthner system, Starch, Alginates, Polyacrylamide, Polyamides, Polyamines, Polyvinyl alcohol, Polyethylene oxide.

Basic concepts underlying the separation of solids from waste liquors are defined, with a short discussion of the physical-chemical principles involved in the two commonly occurring mechanisms, coagulation and flocculation. Polymeric deflocculants are briefly classified as inorganic (silica), natural organic (starch, cellulose, and alginate products), and synthetic organic, which are subdivided into anionic (hydrolyzed polyacrylamide), cationic (polyamides and polyamines) and nonionic (polyvinyl alcohol and polyethylene oxide). The Ruthner system is described with a diagram. Typical results obtained in treating effluents from a fine paper mill, an integrated pulp and fine paper mill, a newsprint mill, and a bleached sulfite pulp mill are also given. (Ward-IPC)
W75-04974

FRACTIONATION OF SPENT SULFITE LIQUORS USING ULTRAFILTRATION CELLULOSE ACETATE MEMBRANES,
Institute of Paper Chemistry, Appleton, Wis.
I. K. Bansal, and A. J. Wiley.
Environmental Science and Technology, Vol 8, No 13, p 1085-1090, Dec 1974. 4 fig, 5 tab, 5 ref.

Descriptors: *Reverse osmosis, *Pulp wastes, *Waste treatment, *Waste water treatment, *Sulfite liquors, *Separation techniques, Industrial wastes, Desalination processes, Membrane processes, Osmosis, Liquid wastes, Permeability, Water purification, Permselective membranes, Water pollution treatment, Water pollution sources, Economics, Membranes, Pollution abatement, Carbohydrates, Lignins.
Identifiers: *Cellulose acetate, Flux rate, Solids rejection, Lignosulfonates.

Purification of softwood-derived calcium-base spent sulfite pulping liquors by ultrafiltration was conducted with standard commercially available cellulose acetate membrane modules from 3 different equipment suppliers provided modules with the cellulose acetate membrane inside the pressurized tubular supports, whereas the third had externally pressurized tubes within a pressure vessel and with the membrane cast on the outside of each tube. Calcium-base spent sulfite liquors containing 20-27% reducing sugars were converted to permeates with 40-66% reducing sugar. The degree of sugar purity increased with higher pressure in each type of membrane module tested. The cellulose acetate membrane modules were operated at inlet pressures of 300-600 psi (21.09-42.18 kg/sq cm) and elevated liquor temperatures of 50-60 C for a period of 500-1100 hr. Feed liquors were concentrated from 10-12% to 30-33% total solids, and the overall average flux rate ranged from 20-44 gal/day/sq ft (0.82-1.79 cu m/day/sq m) during the concentration run. The rejection of lignosulfonates varied from 80 to 95%, whereas the overall solids rejection averaged 50-80%. The cellulose acetate membranes were superior to the dynamic membranes in terms of higher flux rates and higher degree of sugar purity obtained. The loss in membrane flux rates and rejections was low for the 1100-hr duration of these trials. The capability for operation at elevated pressures and temperatures yields higher rates of permeation, thereby improving process economics. (Witt-IPC)
W75-04975

AT ABITIBI, IROQUOIS FALLS, $2.5-MILLION PRIMARY TREATMENT SYSTEM NEARS COMPLETION.
Canadian Pulp and Paper Industry, Vol 27, No 11, p 38-39, Nov 1974. 3 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Sewage treatment, *Canada, Foreign countries, Pulp and paper industry, Sludge disposal, Sewers, Sulfite liquors, Waste treatment, Industrial wastes, Water pollution sources, Water pollution control, Biochemical oxygen demand, Suspended solids, Water quality standards, North America.
Identifiers: Clarifiers, *Iroquois Falls(Ontario-Canada).

Abitibi Paper Co. operates a 1,000 ton/day newsprint mill at Iroquois Falls, Ontario. The primary effluent treatment system, begun in the spring of 1973, is nearing completion. It consists of two 100-foot diameter Eimco clarifiers plus facilities to handle, thicken, and dispose of the sludge. In addition to the new treatment facilities, the mill's sewer systems have been modified and extended to separate lean waste water (containing less than 50 ppm suspended solids) from the process sewer system. The treatment system will come on-line as the various components are tested out and become operational. So far, preliminary tests with effluent from the sulfite and paper mills indicate an 87% solids removal at a flow rate of 10,000 gal/min through both clarifiers. This brings the test effluents in line with the required 50 ppm discharge regulations. Abitibi is presently studying possible methods of secondary treatment to reduce BOD loading. (Witt-IPC)
W75-04976

SURVEY OF NEEDS FOR MUNICIPAL WASTE TREATMENT FACILITIES.
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-230 084, $3.75 in paper copy, $2.25 in microfiche. February, 1972. 39 p, 1 fig, 14 tab.

Descriptors: *Waste water treatment, Municipal wastes, *Treatment facilities, *Sewage treatment, Costs, Water quality control, Water pollution treatment, *Surveys.
Identifiers: *Municipal waste treatment.

A survey was conducted to obtain current estimates of the scope and cost of construction of municipal waste treatment facilities that are needed to meet existing water quality standards implementation schedules or other standards or enforcement requirements. The procedures and findings are explained. (Orr-FIRL)
W75-04978

DESIGN OF A MULTILAYER FILTER FOR USE IN THE WATER TREATMENT INDUSTRIES,
Imperial Coll. of Science and Technology, (England). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 5F.
W75-04979

COLUMNS REPRESENTING MOUND-TYPE DISPOSAL SYSTEMS FOR SEPTIC TANK EFFLUENT: II. NUTRIENT TRANSFORMATIONS AND BACTERIAL POPULATIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
E. R. Magdoff, D. R. Keeney, J. Bouma, and W. A. Ziebell.
Journal of Environmental Quality, Vol 3, No 3, p 228-234, July-September, 1974. 6 fig, 4 tab, 15 ref.

Descriptors: *Septic tanks, Effluents, *Liquid wastes, Potable waters, Eutrophication, Public health, Nitrogen, Phosphorus, Chemical oxygen demand, Soil, Laboratory experiments, Bacteria, *Waste water treatment, *Waste disposal, Water reuse.
Identifiers: *Mound-type disposal systems.

The purification of liquid wastes is associated with health problems relating to the occurrence of pathogenic bacteria and viruses or a high nitrate concentration in potable waters, and eutrophication of ground and surface waters due to nutrients from the effluents. Carbon, nitrogen, and phosphorus transformations and bacterial populations were studied in columns representing a mound disposal system. Total nitrogen, total phosphorus, and the chemical oxygen demand (COD) of the influent (septic tank effluent) averaged 41, 21, and 257 mg/liter, respectively. It was concluded that soil materials, arranged as 60 cm of fill over 30 cm of silt loam to simulate a mound, considerably improved the quality of percolating septic tank effluent. Techniques for application to remove COD, nitrogen, and phosphorus are currently being developed both in field and laboratory experiments. (See also W74-02147) (Prague-FIRL)
W75-04981

RETURN SLUDGE FLOW CONTROL,
Environmental Protection Agency, Washington, D.C. Office of Enforcement and General Counsel.
A. W. West.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-231 085, $3.25 in paper copy, $2.25 in microfiche. September, 1973. 14 p, 4 fig, 1 tab.

Descriptors: Sludge, *Sludge treatment, *Flow control, Flow rates, Environmental sanitation, *Waste water treatment, Biological treatment, *Sewage treatment, Operation and maintenance, Management, Control.

The clarifier sludge flow, which includes both return sludge and excess waste sludge flows, should be adjusted to meet measurable process requirements. The results of a one-hour mixed liquor settlometer test, 15-minute mixed liquor and return sludge centrifuge test, and final clarifier sludge rate that is necessary to keep process equilibrium. The advantage of this control formula is that it responds to almost all loading, process balance and sludge quality characteristics to determine the optimum clarifier sludge flow rate. (Orr-FIRL)
W75-04982

STATUS OF ADVANCED WASTE TREATMENT,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
I. J. Kugelman.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-213 819, $4.75 in paper copy, $2.25 in microfiche. May, 1972. 79 p, 24 fig, 34 tab, 59 ref.

Descriptors: *Waste treatment, *Waste water treatment, Phosphorus, Nitrogen, Activated sludge, *Tertiary treatment, Filtration, Biological treatment.
Identifiers: Chemical treatment, Physical treatment, Waste treatment advances, Treatment methods.

A review of waste treatment is presented with emphasis on those developments ready for full-scale engineering application. Topics covered include waste water characteristics, conventional treatment technology, microstrainers, deep-bed filtration, chemical treatment, phosphorus removal, phosphorus removal in conventional treatment, phosphorus removal by chemical precipitation, nitrogen control, biological denitrification, breakpoint chlorination, selective ion exchange, organic carbon removal, activated carbon adsorption, physical-chemical treatment, ozone oxidation, pure oxygen activated sludge, dissolved inorganics removal, ion exchange, electrodialysis, reverse osmosis, and tertiary treatment. Biological-physical treatment employs a filter to upgrade the performance of conventional treatment. Biological-chemical treatment uses chemical coagulants at differing points for phosphorus removal and improved solids removal. Physical-chemical treatment combines chemical clarification and activated carbon to achieve waste water purity. Biological-chemical-physical treatment combines many processes to achieve a high degree of purity for a large variety of pollutants. (Orr-FIRL)
W75-04983

PHYSICAL-CHEMICAL PROCESSES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
I. J. Kugelman, and J. M. Cohen.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-214 111, $4.25 in paper copy, $2.25 in microfiche. March, 1972. 52 p, 9 fig, 33 tab, 11 ref.

Descriptors: *Sewage treatment, *Chemcontrol, *Physical control, *Waste water treatment, Water clarification, Filtration, Flocculation, Adsorption, Phosphorus, Suspended solids, Pilot plants, Treatment facilities.
Identifiers: Carbon adsorption, *Physical-Chemical treatment.

The various physical-chemical processes used in sewage treatment are discussed. Physical-chemical treatment of sewage is now an alternative to biological treatment, especially for those cases where a high level of phosphorus removal is needed. The clarification-adsorption process utilizes chemical clarification and filtration to achieve almost complete suspended and colloidal solids removal. Chemical clarification involves the addition of an appropriate chemical to the waste water and then flocculation and settling. The carbon adsorption step removes soluble organics from the waste water. Design and performance of some functioning physical-chemical pilot plants are described. (Orr-FIRL)
W75-04984

FEASIBILITY OF HYDRAULIC TRANSPORT AND TREATMENT OF GROUND HOUSEHOLD THROUGH SEWERS,
Foster-Miller Associates, Inc., Waltham, Mass.
A. R. Guzdar, and S. S. Rhee.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-229 256, $7.25 in paper copy, $2.25 in microfiche. April, 1974. 200 p, 67 fig, 9 tab, 38 ref, 2 append.

Descriptors: *Waste water treatment, *Hydraulic transportation, *Sewers, *Solid wastes, Sewage treatment, Sewage disposal, Cities, Domestic wastes, Municipal wastes, Sewage slurry, *Feasibility studies, Pipes.
Identifiers: *Ground household refuse, Solid waste management.

The feasibility of hydraulic transport of ground household refuse through the straight pipes of existing sewers is examined by studying the gravity flow of ground refuse slurry through inclined pipes. the feasibility of treating domestic sewage containing ground refuse was studied by conducting a laboratory analysis of the sewage-refuse slurry. It was concluded that the transport of ground refuse through existing sewer lines is feasible and that it is also feasible to treat ground refuse in sewage in at least 0.5 to 1 percent concentrations, with qualifications. (Orr-FIRL)
W75-04985

DOMESTIC WATER AND WASTE TREATMENT SUBSYSTEM, OPERATION AND MAINTENANCE MANUAL,
General Electric Co., Philadelphia, Pa. Space Div.
T. M Gresko, and R. W. Murray.
Available from the National Technical Information Service, Springfield, Va. 22161 as N74-16839. October, 1973. 28 p, 8 fig, 2 tab.

Descriptors: *Waste treatment, *Operation and maintenance, Domestic wastes, Domestic water, *Waste water treatment, *Treatment facilities.
Identifiers: *Operation and maintenance manual.

This manual for the operation and maintenance of a treatment substation is divided into three parts. The first part, Substation Operating Instructions, contains information n electrical connections, inlet/outlet connections, start-up, bypass controls, settings, operating conditions, and system mobilization. Maintenance Instruction explains the periodic maintenance on the incinerator dump, nozzle trap cleaning, and filters; a trouble shooting guide and teardown procedures for the evaporator/condenser, the catalytic oxidizer and the pumps are included. The third part of the manual is a list of parts and materials. (Orr-FIRL)
W75-04986

EFFECT OF CARBON TO NITROGEN RATIO ON ACTIVATED SLUDGE SUBSIDENCE AND DEWATERING CHARACTERISTICS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
A. Geinopolos.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-230 941, $5.75 in paper copy, $2.25 in microfiche. March, 1974. 126 p, 12 fig, 32 tab, 26 ref.

Descriptors: *Sludge disposal, *Pulp and paper industry, *Activated sludge, Carbon, Nitrogen, Industrial wastes, Biological treatment, Pulp wastes, *Dewatering, *Waste water treatment.

Identifiers: *Carbon to ammonia nitrogen ratio, Scott Paper Company.

The handling and disposal of waste sludge is one of the most important and most difficult problems in the design and operation of waste treatment facilities. Investigations were conducted to determine the effect of the ratio of organic carbon to ammonia nitrogen on activated sludge subsidence and dewatering characteristics. Changes in the carbon-nitrogen ratio were made on one of two activated sludge systems of a pulp and paper mill. When both the control and test sludge systems were operated under similar operating conditions, the solids produced from both systems had similar subsidence, thickening and filtration properties. When both sludge systems were nitrogen sufficient, the carbon-nitrogen ratio had an appreciable effect on the solids subsidence and compaction properties. The carbon-nitrogen ratio appears to be a good control measure in the activated sludge treatment of nitrogen deficient wastes. At the Scott Paper Company in Mobile, Alabama, the optimum carbon-nitrogen ratio seems to be equal to or less than 15. (Orr-FIRL)
W75-04987

EVALUATION OF NEW REVERSE OSMOSIS MEMBRANES FOR THE SEPARATION OF TOXIC COMPOUNDS FROM WASTEWATER,
Illinois Univ., Urbana. Environmental Engineering Program.
E. S. K. Chian, and H. H. P. Fang.
Available from the National Technical Information Service, Springfield Va. 22161 as AD-775 850, $4.25 in paper copy, $2.25 in microfiche. September 1973. 60 p, 12 fig, 10 tab, 15 ref, 5 append.

Descriptors: *Reverse osmosis, *Separation techniques, *Sewage treatment, *Membranes, *Waste water treatment, Desalination pocesses, Water quality control, Membrane processes, Organic compounds.
Identifiers: Cellulose acetate membrane, Aromatic polyamide membranes, Crosslinked-polyethylenimine ultrathin membrane.

New reverse osmosis membranes for the removal of toxic organic compounds from waste waters are evaluated. The reverse osmosis membranes were tested for separation with a solution of 14 model compounds, including all the major groups of organic compounds and with a sodium chloride solution to determine salt rejection and flux. Membranes made of cellulose acetate or its derivatives showed unsatisfactory organic compounds separation but were very high in salt rejection. Membranes made of aromatic polyamide showed good separation of the model compounds but relatively low fluxes. The membranes made of crosslinked-polyethylenimine were most satisfactory in terms of model compound separation and in terms of flux. This study confirms that solute separation is closely related to the chemical nature of the membrane materials rather than the size of the pore openings of the membrane. (Orr-FIRL)
W75-04988

COST OPTIMIZATION OF ACTIVATED SLUDGE SYSTEMS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
A. C. Middleton, and A. W. Lawrence.
Biotechnology and Bioengineering, Vol 16, No 6, p 807-826, June 1974. 6 fig, 2 tab, 17 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Aerobic treatment, Biomass, *Costs, Separation techniques, Solids contact processes, Sewage treatment.

A rational approach to the least cost design of an integrated activated sludge water treatment system is described. Included are the processes of activated sludge reactor, final settling tanks, gravity thickening and aerobic sludge digestion; capital, maintenance and operation costs are also considered. The optimum acceptable design is taken as a combination of the parameters considered, which include biological reactor design, biological solids retention time, liquid-biomass separation, and trade-offs among the separate components involved in the machinery. (Carpenter-FIRL)
W75-04990

RECOVERY OF TRACE METALS FROM AQUEOUS SOLUTION - REVIEW ARTICLE,
Birmingham Univ. (England). Dept. of Chemical Engineering.
A. B. Clarke.
Chemical Engineer, Vol 25, No 1, p 19-23, 1974. 1 fig, 13 ref.

Descriptors: *Metals, *Waste water treatment, *Chemcontrol, *Aqueous solutions, Ion exchange, Foam fractionation, Separation techniques, Water pollution sources, Reviews, Trace elements, Metals.
Identifiers: Liquid-liquid extraction, Electrolysis, *Metals recovery.

Recent methods devised for the recovery of trace metals from aqueous solutions are reviewed. The ion exchange method is used for effecting separations at low concentrations. Liquid-liquid extraction using long chain anines is used when metal ions are not in the simple cationic form but in a stepwise series of mononuclear complexes and acting as anionic species. Foam fractionation, an adsorptive bubble technique, is used because of the versatility of the techniques and their potentiality for purposes ranging from chemical analysis to plant operation. A number of electrolysis methods have been developed for the treatment of wastes. The advantages and disadvantages of these methods are discussed. (Orr-FIRL)
W75-04991

DEGRADATION OF LIGNIN BY COMBINED CHEMICAL AND BIOLOGICAL TREATMENT,
Betz Labs., Inc., Trevose, Pa.
A. M. Stern, and L. L. Gasner.
Biotechnology and Bioengineering, Vol 16, No 6, p 789-805, June 1974. 7 fig, 3 tab, 14 ref.

Descriptors: *Ozone, *Lignins, *Color, Biomass, Costs, *Ozonation, Carbon, *Waste water treatment, Biodegradation, Degradation(Decomposition).
Identifiers: *Combined treatment(Chem-Bio).

The ozonation of lignin produce a series of decolorized products usable by microorganisms as a sole source of carbon. The color reduction is accompanied by a shift to lower weight species. At least 40 percent of the ozonated material can be transferred into microbial biomass and other products of commercial interest. Costs compare favorably with competitive decolorization processes. (Carpenter-FIRL)
W75-04992

BETHLEHEM TREATS 80 MILLION GALLONS OF WASTEWATER EACH DAY.
Industrial Wastes, Vol 22, No 3, p 36, May-June 1974.

Descriptors: *Aeration, Oxygenation, Sedimentology, *Waste water treatment, *Maryland, *Industrial wastes, Steel, Waste treatment, Dissolved oxygen.
Identifiers: *Sparrows Point(Md), Steel mill waste treatment, Aerators.

The Bethlehem Steel Corporation plant at Sparrows Point, Maryland has expanded its waste water treatment program with a facility in use since early 1971. Discharges treated include coarse and fine mill scale, oils, greases and wastes from pickling operations. After it is screened of floating debris, the waste water passes into a chamber where three 75 HP LIGHTNIN' aerators transfer enough oxygen to fulfill mixing and aerating requirements. The water then flows into a channel with settling basins, where suspended solids are removed by a floating dredge. The water, which is automatically monitored for pH and flow, is collected at a pumping station, where two additional aerators insure that the minimal dissolved oxygen content is achieved. (Carpenter-FIRL)
W75-04993

THE NEATH VALLEY SEWERAGE SCHEME.
Pipes and Pipelines International, Vol 18, No 3, p 25-26, June 1974. 1 fig.

Descriptors: *Pipes, *Pipelines, *Sewers, *Metal pipes, Joints(Connecions), Water conveyance, Sewerage, Hydraulic structures, Engineering structures, Great Britain.
Identifiers: *Neath Valley(Gt Brit), Iron pipes, Stantyte joints.

The development of 1200 mm diameter ductile iron pipe made available large diameter pipe with the strength of steel but possessing corrosion-resistant qualities better than those of gray steel. The Neath Valley Joint Sewerage System, Neath Valley, Great Britain, will use 2200 m of this pipe with a concrete lining. This pipe will receive the effluent from a pumping station equipped for grit removal and the screening of solids, and will convey the effluent to a submarine outfall. The pipes are being laid on a bed of crushed limestone aggregate and sand is used to surround the pipes. Polyethylene sleeves provide additional protection against corrosion. The pipes are connected by Stantyte joints, which are specially shaped rubber gaskets which fit in the sockets; the joints are completed by pushing the spigots into the sockets of mating pipes. (Orr-FIRL)
W75-05000

ACCUTE TOXICITY AND DETOXIFICATION OF KRAFT PULP MILL EFFLUENT,
International Pacific Salmon Fisheries Commission, New Westiminster (British Columbia).
For primary bibliographic entry see Field 5C.
W75-05014

PHYSICAL-CHEMICAL TREATMENT OF MUNICIPAL WASTES BY RECYCLED MAGNESIUM CARBONATE,
A. P. Black, A. T. DuBose, and R. P. Vogh.
Environmental Protection Agency, Technology Series report, EPA-660/2-74-055, June 1974. 113 p, 4 fig, 71 tab, 53 ref, append. EPA Grant 12130 HRA.

Descriptors: *Waste water treatment, *Coagulation, *Sludge treatment, *Nurtient removal, *Municipal wastes, Recycling, Magnesium carbonate, Magnesium hydroxide, Lime, Calcium carbonate, Carbon, Carbon dioxide.
Identifiers: *Magnesium carbonate-lime treatment, *Clinoptilolite.

The applicability to municipal wastes of the recently discovered magnesium carbonate-lime water treatment process has been investigated. A sixteen-month laboratory study was conducted and was followed by an eight-month pilot plant study. Four wastewaters with COD values varying from 200 to 1,500 mg/l were examined. Bench-scale coagulation studies designed to compare the effect of added MgCO3 with treatment by lime only showed a 0%-30% greater reduction in effluent COD residuals. Color and turbidity reduction by the magnesium-plus-lime process averaged 50%-85% greater when compared to treatment by lime only. A series of 72-hour pilot plant runs was conducted with the magnesium precipitated increased after each three day period. Effluent characteristics improved as the amount of magnesium precipitated was increased. Influent and filter effluent samples were collected every four

hours and analyzed for COD, TOC, total phosphorus, alkalinity, hardness, calcium, and magnesium. Values for BOD were determined from composited samples. The percentage reduction in chemical (COD) and biological (BOD) oxygen-consuming substances ranged from a low of 70% for no magnesium ion precipitated to a high of 90% for 30 milligrams per liter of magnesium ion precipitated. Higher dosages have not yet been investigated. (EPA)
W75-05071

STUDIES OF LOW MOLECULAR WEIGHT LIGNIN SULFONATES,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5A.
W75-05072

BIOLOGICAL TREATMENT OF CONCENTRATED SUGAR BEET WASTES,
Beet Sugar Development Foundation, Fort Collins, Colo.
J. H. Fischer.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.75. Environmental Protection Agency, Technology Series Report, EPA-660/2-74-028, June 1974. 100 p, 13 fig, 39 tab, 38 ref, 3 append. EPA Project 12060 FAK.

Descriptors: *Biological treatment, Colorado, Recycling, *Waste water treatment, Water reuse, Quality control, Reclaimed water, Pollution abatement, Treatment facilities, *Industrial wastes, *Recirculated water, Sugar beets, Suspended solids, Separation techniques, *Anaerobic digestion, Dissolved solids.
Identifiers: *Sugar beet waste treatment, *High solids flume water, Suspended solids separation.

A study of the variables influencing a closed loop recirculating flume water system for conveying sugarbeets for processing was conducted at Longmont, Colorado. Settleable solids were removed by screening, addition of milk of lime and settling; the concentration of dissolved solids increased daily during the processing season. The increasing concentration caused no problem provided the pH was 10 or greater and that the water temperature did not exceed 20C. A deep anaerobic pond received surplus system waters and the total system waters when operations ceased. Anaerobic digestion was aided by addition of nutrients and odors reduced surface aeration. Water eventually met discharge standards, and was used the second year to fill the system. (EPA)
W75-05078

AN INVESTIGATION OF ION REMOVAL FROM WATER AND WASTEWATER,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
R. J. Starkey, Jr., M. E. Kub, A. E. Binks, and K. K. Jain.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.95. Ecological Research Series Report, EPA-660/3-74-022, August 1973. 116 p, 38 fig, 19 tab, 14 ref, 5 append. EPA-68-01-0904.

Descriptors: *Capillary membrane dialysis, *Alumina adsorption, Macromolecules, Alum.
Identifiers: *Waste water treatment, *Coagulation, Nitrogen, Carbon, Phosphorus, Cations, Anions, Dissolved solids, Conductance, Hardness(Water), Polyelectrolyte, Hydrogen ion concentration, *Nutrient removal, Bioassay.

Three standardized techniques (capillary membrane dialysis, alumina adsorption, alum/polyelectrolyte coagulation) have been compared under laboratory conditions to determine their relative effectiveness in removing a broad spectrum of nutrients, cations, and anions from freshly collected samples of stream water and wastewater effluent (secondary and tertiary). Alumina adsorption was highly effective in removal of phosphorus, inorganic carbon, as well as most cations with concomitant reduction of specific conductance and hardness. High Kjeldahl and ammonia nitrogen removal efficiencies of alumina were only observed in samples of wastewater in which pre-treatment concentrations were relatively high. Dissolved solids content and pH of alumina treated samples were consistently observed to increase. Dialysis occupied an intermediate position in respect to cation removal, but produced results equivalent to alumina adsorption in respect to inorganic carbon. Failure to significantly reduce organic carbon concentrations was attributed to its association with macromolecules having a molecular weight greater than 5000 (the cutoff of the cellulose membrane under consideration). Superiority of dialysis in removal of sodium, potassium chloride, nitrate-nitrite, boron, and dissolved solids is reported. Coagulation was effective in removing phosphorus from all waters but was highly ineffective in respect to all other parameters tested. (EPA)
W75-05080

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS,
East Central State Coll., Ada, Okla. School of Environmental Science.
For primary bibliographic entry see Field 10B.
W75-05084

RUM DISTILLERY SLOPS TREATMENT BY ANAEROBIC CONTACT PROCESS,
Bacardi Corp., San Juan, Puerto Rico.
T. G. Shea, E. Ramos, J. Rodriguez, and G. H. Dorion.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.75. Environmental Protection Agency, Technology Series Report, EPA-660/2-74-074, July 1974. 99 p, 16 fig, 15 tab, 30 ref, append. EPA Project 800935; Program Element 1BB037.
W75-05086

MEASUREMENT OF RESIDUAL CHLORINE LEVELS IN COOLING WATER--AMPEROMETRIC METHOD,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5A.
W75-05088

NEW MEMBRANES FOR REVERSE OSMOSIS TREATMENT OF METAL FINISHING EFFLUENTS,
Minnesota Pollution Control Agency, Minneapolis.
Lee T. Rozelle, C. V. Kopp, Jr., and K. E. Cobian.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.40. Environmental Protection Agency, Technology Series Report, EPA-660/2-73-033, December 1973. 66 p, 13 fig, 16 tab, 10 ref, append. EPA Project 12010 DRH.

Descriptors: *Reverse osmosis, Water pollution, *Waste water treatment, *Membranes, Laboratory tests, *Industrial wastes, Desalination.
Identifiers: *Metal finishing wastewaters, *Polymer membranes, Metal salts, Electroplating wastes.

An important new membrane has been developed for the reverse osmosis treatment of both highly alkaline and acidic (non-oxidizing) metal finishing rinse waters. This membrane designed NS-1, and originally developed for seawater desalination, consists of a microporous support film (polysulfone) coated with polyethylenimine which is cross-linked with tolylene 2,4-diisocyanate. Simulated alkaline copper and zinc cyanide plating rinses at pH's 11.8 and 12.9 were treated by NS-1 membranes during 500- and 340-hour tests without deterioration of reverse osmosis properties. Water fluxes above 10 gallons per square foot (of membrane) per day (gfd) were observed with cyanide rejections between 95 and 99 percent. The NS-1 membrane also treated simulated copper sulfate rinse waters effectively at pH 0.5 during 550-hour tests without deterioration of reverse osmosis properties (fluxes above 10 gfd with 99.8 percent rejection of copper). The NS-1 membrane is the only known membrane that can perform well using both acidic and alkaline feed solutions. Preliminary engineering considerations indicated the feasibility of applying the NS-1 membrane to reverse osmosis treatment and recycle of nickel and zinc cyanide electroplating rinse waters. (EPA)
W75-05089

THREE-STEP MEASUREMENT BY THE SAPROMAT TO EVALUATE THE BOD5, THE MINERAL IMBALANCE AND THE TOXICITY OF WATER SAMPLES,
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
For primary bibliographic entry see Field 5A.
W75-05162

TEMPERATURE INDUCED VARIATIONS OF KINETIC COEFFICIENTS FOR TEXTILE-DOMESTIC WASTE MIXTURES,
Auburn Univ., Ala. Dept. of Civil Engineering.
R. E. Topping.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 955, $4.75 in paper copy, $2.25 in microfiche. MS Thesis, December 1973. 70 p, 19 fig, 7 tab, 4 append. OWRR A-034-ALA(2).

Descriptors: *Domestic wastes, *Kinetics, *Temperature, Waste treatment, *Pulp wastes, Industrial wastes, *Waste water treatment, *Textiles, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: Organic carbon.

Temperature induced variations of kinetic coefficients for different textile-domestic waste mixtures were investigated. Kinetic coefficients were reported in terms of soluble COD, BOD, and TOC. At a given mixture ratio as temperature increased from 15 to 30C, maximum specific growth rate increased, saturation constant decreased, yield coefficient increased, and specific mortality constant remained constant. In order to predict the effect of temperature change on the kinetic coefficients, values of numerical constant for the van't Hoff-Arhenius relationship were determined for 10:90 and 25:75 textile-domestic waste mixtures. At a given temperature as the percentage of textile waste in the mixture increased from 10 percent to 25 percent, maximum specific growth rate, saturation constant, and specific mortality constant all increased in value. As the operating temperature increased, the strength of the effluent decreased and the value of minimum detention time decreased.
W75-05264

GROWTH KINETICS OF NITRIFYING MICROORGANISMS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
E. K. Mattern, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 954, $3.75 in paper copy, $2.25 in microfiche. Special Research Problem Report, June 1973. 31 p, 10 fig, 4 tab, 8 ref. OWRT A-058-GA(1). 14-31-0001-5010.

Descriptors: *Waste water treatment, *Nitrification, Ammonia, Nitrates, Nitrites, *Nitrogen fixing bacteria, Water pollution, Biochemical oxygen demand, Bacteria.

Identifiers: Carbonaceous bacteria, Nitrifying bacteria, Nitrosomonas bacteria, Nitrobacter bacteria.

Laboratory studies were used to determine the growth parameters of the organisms which control nitrification. The results showed that the yields of carbonaceous bacteria are about equal to those of nitrifying bacteria but that the maximum specific growth rate of the carbonaceous bacteria is about three times that of nitrifying bacteria. The growth of the carbonaceous bacteria is also much more sensitive to changes in nutrient concentration. The nitrosomonas bacteria, which convert ammonia to nitrate, control the nitrification process since nitrobacter bacteria, which convert nitrite to nitrate, have a higher maximum specific growth rate. (James-Geo Tech)
W75-05267

DETERMINATION OF THE EFFECT OF CARBONACEOUS SUBSTRATE CONCENTRATION ON THE RATE OF NITRIFICATION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
W. M. Saltenberger.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 956, $4.25 in paper copy, $2.25 in microfiche. Special Research Problem Report, May 1974. 57 p, 19 fig, 3 tab, 19 ref, 2 append. OWRT A-058-GA(2). 14-31-0001-5010.

Descriptors: *Nitrification , *Nitrogen fixing bacteria, *Waste water treatment, Ammonia, Nitrates, Nitrites, Biological treatment.
Identifiers: *Bio-disc reactors, *Bacteria growth kinetics.

Nitrification or the conversion of ammonia nitrogen to nitrites and nitrates is increasingly recognized as an important component of waste water treatments particularly when treated effluents are discharged into small streams. Effective treatment design requires full consideration of the kinetics of the nitrification process and the effects on that process of various substrate concentrations and various inhibitory materials. The process kinetics were examined in the laboratory with a rotating biological contactor. Results are presented on nitrification rates, the relationship of the rate to active surface area, area-capacity and saturation constants, and the effects of ammonia on the process. (James-Geo Tech)
W75-05268

NITROGEN REMOVAL OBTAINED THROUGH HETEROTROPHIC GROWTH IN TRICKLING FILTERS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
S. Suwan arpa.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 925, $4.25 in paper copy, $2.25 in microfiche. Special Research Problem Report, August 1974. 57 p, 11 fig, 8 tab, 20 ref, 3 append. OWRR A-058-GA(3). 14-31-0001-5010.

Descriptors: *Nitrification, *Nitrogen fixing bacteria, Bacteria, Biochemical oxygen demand, *Trickling filters, *Waste water treatment.
Identifiers: Bacteria growth kinetics.

Conventional biological treatment facilities are efficient in removing carbonaceous materials, but most remove only a small fraction of the biochemical oxygen demand exerted by nitrogen. This study investigated the use of plastic media trickling filters, and the growth kinetics of the heterotrophic bacteria on the filters, for more complete treatments. Mixed substrate environments were examined with the help of a mathematical model. Laboratory results are summarized on removal rates for glucose and ammonia-nitrogen under various conditions. Kinetic constants are tabulated. (James-Geo Tech)
W75-05269

QUICK-TIME INSTRUMENTAL MEASUREMENTS OF WASTE-WATER ORGANIC CHARACTERISTICS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W75-05304

WATER SUPPLY, TREATMENT, DISTRIBUTION, AND REUSE OPTIMIZATION IN ARID URBAN AREAS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. R. Walker, G. V. Skogerboe, and R. C. Ward.
Water Resources Bulletin, Vol 10, No 6, p 1187-1197, December 1974. 7 fig, 18 ref. OWRT B-043-COLO(13).

Descriptors: Water management(Applied), *Water supply, *Water distribution(Applied), *Waste water treatment, Recycling, Evaluation, Institutional constraints, Alternative planning, Water quality, Regions, Arid lands, Agriculture, Interbasin transfers, Decision making, Costs, *Optimization, Biochemical oxygen demand, Total dissolved solids, Mathematical models, Systems analysis, *Water reuse, *Colorado.
Identifiers: *Urban water systems, Denver(Col), Agricultural transfer, South Platte River(Col), Cost minimization, Policies.

A management level model has been formulated in which a systems analysis format is employed to evaluate urban water management strategies. The model incorporates a multilevel optimization scheme to coordinate urban water supply, distribution, and wastewater management. The model is applied to the water management problems of the Denver, Colorado metropolitan area, which has used both agricultural transfers and transmountain diversions to supplement the natural stream resources of the South Platte River. Although plans are being made to increase the capacity of these sources, increasingly stringent standards on the area's effluents are enhancing the feasibility of reclaiming and recycling a portion of the wastewater. The urban model examines management characteristics and institutional constraints in the Denver area, considers alternative management strategies, and determines the least-cost combination of water supply sources. By formulating the model from a planner's vantage point, the most important results gained from the analysis are the costs of various institutional constraints which may restrict the decision maker's ability to implement optimal policies. The savings to individual municipal and industrial users derived from public acceptance of recycling is shown, and the ratios of present water supply costs to those expected in the future for a recycling alternative involving relaxed quality constraints on individual urban demands are given. (Bell-Cornell)
W75-05322

HIGH-RATE FILTRATION FOR TORONTO'S ISLAND WATERWORKS,
For primary bibliographic entry see Field 5F.
W75-05324

DOLLAR GAIN TO TOP COST CLIMB IN 1975 SEWERAGE CONSTRUCTION.
Engineering News Record, Vol 195, No 15, p 14-15, October 3, 1974. 1 fig, 1 tab.

Descriptors: *Construction costs, Municipal water, *Sewerage, Construction, Costs, Grants, *Treatment facilities, Waste water treatment, Sewage treatment.

Contracting plans were reported by 75 major sanitary districts in the United States, with about $5 billion in new work being bid for fiscal year 1975-1976. Despite inflation close to 20%, the Environmental Protection Agency anticipates dollar gains, related to sewerage construction cost indices. Many projects scheduled for contracts in the next year are hold-overs from previous years, where federal grants had been postponed. Construction costs have increased up to 30% for treatment plants and about 15% for interceptor plants. However, the financing needed to activate the contracts may be easier to obtain in fiscal 1975. State and municipal bond sales for sewerage construction have increased 66%, a rate more than double the increase of a year ago. Much of the 1975 sewerage construction is dependent upon federal aid, with EPA grants projected to total $3.5 billion, as opposed to 1974's $2 billion. (Prague-FIRL)
W75-05325

MEASURING SEWAGE FLOW USING WEIRS AND FLUMES,
Ontario Ministry of the Environment, Toronto. Project Operations Branch.
G. Mougenot.
Water and Sewage Works, Vol 121, No 7, p 78-81, July, 1974. 2 fig, 10 ref.

Descriptors: *Sewage disposal, *Waste water treatment, *Weirs, *Flumes, Hydraulics, Flow.
Identifiers: 'V' notch weirs, Rectangular weirs, Parshall flumes.

Two basic problems of flow measurement by means of weirs and flumes are the primary device and the method for the 'head' measurement. Although the primary and secondary devices are joined as an installation, they are usually separately manufactured, with the installation consisting of a check of the relationship of the datum point of the one device to that of the other. These devices have been popular in irrigation systems. However, when being used in sewage works, most weirs and flumes are not installed in hydraulic situations approximating those in irrigation for which rating tables were made. A 'V' notch weir is used where head loss is tolerable, and must not be used where the fluid flow contains entrained materials which could plug the notch. Settleable materials might degrade the performance of this weir if the materials collect on the upstream side. The fluid flow through the notch should clear the downstream side of the bulkhead, leaving air under the 'nappe'. The head/flow ratio at low heads is greater than at high heads. Installation costs are less than those for the Venturi flume. Parshall flume accuracy is dependent upon the accuracy of construction; strict adherence to the dimensions given is a necessity. (Leibowitz-FIRL)
W75-05326

LASL WASTE SYSTEM BACKS UP INTO STREET.
Nuclear News, Vol 17, No 13, p 106, October, 1974.

Descriptors: *Radioactive wastes, *Sewers, Waste water treatment, Pollutants, Environmental effects, Path of pollutants, Water pollution control, New Mexico.
Identifiers: *Plutonium, Los Alamos(NMex).

At Los Alamos Scientific Laboratory (LASL) in July and September, 1974, a sewer line carrying waste water with low-level concentrations of plutonium one and a half miles to a reprocessing plant backed up, ruptured, and spilled water into nearby streets. The activity of the waste was considered low-level, but might be high-level as an environmental pollutant. During the first incident, waste trickled into the ground near the point of rupture. The second incident sent hundreds of gallons of waste through a manhole, along a gutter, into a sewer intake, and finally into a dry canyon. Waste penetrated the sandy soil of a dry bed, one to two feet wide, to a depth of a few inches. Cleanup of the radioactive wastes entailed removing the con-

taminated soil to a burial area and asphalting the street. (Prague,FIRL)
W75-05327

THEY'RE FOREVER BLOWING BUBBLES.
Compressed Air, Vol 79, No 8, p 10-11, August, 1974.

Descriptors: *Equipment, Design criteria, *Waste water treatment, *Sewage treatment, *Bubbles, Liquid wastes, Aeration.
Identifiers: *Air diffusers.

One of the simplest and most effective air diffusers for sewage treatment is the so-called inverted reservoir type developed and manufactured by Sanitaire Water Pollution Control Corporation of Milwaukee, Wisconsin. In this mechanism air passes from a header into the diffuser with exit ports being two rows of holes, one on each side of the air reservoir. Below the diffuser's open base, a V-shaped deflector plate directs the flow of waste liquor up along its outer wall. As the air comes out, it is sheared into relatively small bubbles and then well distributed throughout the waste water in the basin. Determinations influencing the design of the Sanitaire diffuser are outlined. (Sandoski-FIRL)
W75-05328

TREAT WASTEWATER LIKE DOWNTOWN TRAFFIC,
R. J. Martin.
The American City, Vol 89, No 8, p 61-62, August, 1974.

Descriptors: *Automatic control, *Control systems, *Waste water treatment, Equipment, Sludge treatment, Costs, Performance, *New York, Water pollution control.
Identifiers: Sherburne(NY).

A 340,000 gpd waste water treatment plant in Sherburne, New York is a single-stage, high-rate trickling filter operation that has held costs to a minimum, obtained quality results, and reduced labor requirements by installing a process controller. All steps involved in handling sludge or supernatant are started and stopped by a Tenor preset controller system. The program interval is controlled by a timer that can be set from one hour to 60 hours. Any malfunction will either return all units to the 'at rest' mode or permit the program to continue, if it is safe to do so. The cost of the complete system is around $25,000. (Sandoski-FIRL)
W75-05329

VIRUS REMOVAL BY DIATOMACEOUS EARTH FILTRATION,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W75-05330

CARBONATION SYSTEM FOR RECOVERY OF SODIUM BASE PULPING LIQUOR,
Owens-Illinois, Inc., Cincinnati, Ohio. (assignee)
C. G. Anderson.
United States Patent 3,826,710. Issued July 30, 1974. Official Gazette of the United States Patent Office, Vol 924, No 5, p 1301, July 30, 1974. 1 fig.

Descriptors: *Patents, *Liquid wastes, Equipment, *Pulp wastes, Sodium compounds, Sulfite liquors, Sulphur compounds, Carbon dioxide, *Waste water treatment, *Industrial wastes, *Recycling, Water reuse.
Identifiers: Carbonation system.

An integrated closed carbonatin system for recovering sodium base sulfite pulping liquor includes: smelt solutions which contain from one third to two thirds mol percent sodium sulfide with the balance primarily sodium carbonate; self-sufficiency in carbon dioxide for displacement of the sulfide; temperatures during carbonation from 140 to 180 degrees F; an intermediate concentration of carbon dioxide for carbonation; and systems for cycling different gas streams to conserve and reuse carbon dioxide. The system also produces gases containing hydrogen sulfide suitable for direct combustion to sulphur dioxide and purges gases relatively free of hydrogen sulfide or sulphur dioxide. (Orr-FIRL)
W75-05331

RECOVERY OF RESIDUAL AMMONIA FROM WEAK AQUEOUS SOLUTIONS THEREOF,
I. Mavrovic.
United States Patent 3,826,815. Issued July 30, 1974. Official Gazette of the United States Patent Office, Vol 924, No 5, p 1320, July 30, 1974. 1 fig.

Descriptors: *Patents, Ammonia, Equipment, Aqueous solution, *Waste water treatment, *Liquid wastes, Water treatment, Recycling.
Identifiers: *Ammonia recovery.

A method for recovering ammonia from a waste liquid effluent composed of a weak ammoniacal aqueous solution is described. The solution is stripped with steam and an inert gas in a fractionator at specific conditions. Substantially all of the ammonia is recovered in a gaseous product and a liquid product is recovered that is substantially free of ammonia. (Orr-FIRL)
W75-05332

WASTEWATER COLLECTION (LITERATURE REVIEW),
Nottingham (H.D.) and Associates, McLean, Va.
H. D. Tara Singh.
Journal Water Pollution Control Federation, Vol 46, No 6, p 1191-1195, June, 1974. 43 ref.

Descriptors: *Sewers, *Design, *Construction, *Operation and maintenance, Flows, Pipes, Costs, Computer programs, Water Pollution Control Federation, *Reviews, *Bibliographies, *Waste water treatment.
Identifiers: *Waste water collection.

A literature review of waste water collection is presented. Topics include strategies of the Water Pollution Control Federation, sewer design and construction, sewer monitoring and maintenance, and economic considerations. Pressure sewers, computer programs for design and cost, a modified dynamic program of collection, and infiltration rates and materials of sewer construction are discussed. Techniques for measuring flows in sewers, smoke testing of sewers, and insertion techniques to use polyethylene pipe to repair defective sewers are presented. Various ways in which communities have saved money with their sewer systems are reported. (Orr-FIRL)
W75-05335

QUARTERLY PROGRESS REPORT, RESEARCH AND DEVELOPMENT ACTIVITIES, WASTE FIXATION PROGRAM, JULY THROUGH SEPTEMBER 1974,
Battelle-Pacific Northwest Labs., Richland, Wash. Nuclear Waste Technology Dept.
J. L. McElroy.
Available from NTIS, Springfield, Va. 22161 as Rept. No BNWL-1871, $5.45 in paper copy $2.25 in microfiche. Report BNWL-1871, p 62, November 1974. 22 fig, 12 tab.

Descriptors: *Waste treatment, Treatment facilities, *Radioactive waste disposal, *Research and development, *Metals, *Corrosion, *Evaporation, Heating, Metallurgy, Temperature, Viscosity.
Identifiers: *Calcination, Annealing, Glass.

Three melting concepts are being evaluated currently for use in converting waste calcine to glass. These are a resistance heated metallic melter, a joule heated (electric) ceramic melter, and in-can melting. The metallic melter is made of Inconel-690; however, tests are under way to locate a better material. One possibility is an Inconel-690 weld overlay, since corrosion experience with the Inconel-690 melter indicates moderate attack to the base metal but essentially no attack at the welds. Several metallic melter runs were completed to (1) test coupling of the melter to a wiper film evaporator to evaluate feeding slurry to the melter, (2) determine the maximum melt viscosity that could be drained from the freeze valve, and (3) produce five large glass castings for annealing studies. Detail of progress is given. (Houser-ORNL)
W75-05347

WASTE MANAGEMENT AND TRANSPORTATION TECHNOLOGY DEVELOPMENT, QUARTERLY REPORT, JULY 1974 THROUGH SEPTEMBER 1974.
Atlantic Richfield Hanford Co., Richland, Wash. Research Dept.
Available from NTIS, Springfield, Va. 22161 as Rept No ARH-ST-110-A, $5.45 in paper copy, and $2.25 in microfiche. Report ARH-ST-110 A, p 119, November 1974. 18 fig, 17 tab, 8 ref.

Descriptors: *Radioactive waste disposal, *Radioactive wastes, *Management, *Transportation, Technology, Research and Development, Water pollution treatment, Waste storage, *Waste treatment, Hazards, Safety, Radioactivity, *Washington.
Identifiers: Decommissioning, Decontamination(Solids), Immobilization, Hanford Site(Wash).

This is the first in a series of quarterly progress reports on activities in support of long-term management of Hanford high-level waste. A variety of specific topics are discussed in some technical depth. These topics can be grouped in the areas of: salt cake retrieval, tank reliability, equipment decommissioning, and increased waste immobilization. (Houser-ORNL)
W75-05348

5E. Ultimate Disposal Of Wastes

ADDENDUM TO THE ENVIRONMENTAL ASSESSMENT, ANNEX B, LAS VEGAS WASH/BAY POLLUTION ABATEMENT PROJECT,
VTN Nevada, Las Vegas.
Clark County Board of Commissioners, Las Vegas, Nevada, July 1974. 127 p, 22 fig, 28 tab, 37 ref, 7 append.

Descriptors: *Environmental effects, *Water pollution control, *Assessments, *Alternate planning, *Environmental control, Waste water disposal, Waste water treatment, Groundwater recharge, Tertiary treatment, Ultimate disposal, Underground waste disposal, Nevada.
Identifiers: *Impact studies, *Lake Mead, *Las Vegas.

Municipal and industrial wastewaters from the Las Vegas Valley along with highly saline subsurface flows are discharged into Las Vegas Wash, thereby polluting Lake Mead and the Colorado River downstream. The principal effects of the pollution have been algal blooms in the Las Vegas Bay of Lake Mead, and increases to the salt load of the Colorado River. The 1971 Nevada Legislature designated the Las Vegas Valley Water District (LVVWD) as the agency responsible for developing a plan to abate the pollution caused by wastewater flows in Las Vegas Wash. The purpose of this Environmental Assessment Addendum is to reevaluate the nine previously considered alternatives along with a new alternative. Under the newly proposed alternative, wastewater would be collected at a central point and given advanced wastewater treatment sufficient to meet

water quality standards. Effluent from this facility would be available for use by: (1) Allen Power Project, (2) an in-valley irrigation program, (3) a water source for a pilot groundwater recharge program, (5) maintenance of a greenbelt in Las Vegas Wash, and (6) return flow credit from the Colorado River when returned to Lake Mead. Also presented are the relevant laws, regulations and policies that guided the formulation of the study and impace identification. (Poertner)
W75-04869

WATER TREATMENT WITH ACTIVATED CARBON MADE FROM SLUDGE AND WASTE PAPER,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W75-04941

NEW DEVELOPMENTS IN EFFLUENT LEGISLATION, ESPECIALLY LAWS GOVERNING EFFLUENT DISPOSAL (NEUERUNGEN AUF DEM ABWASSERRECHTS-SEKTOR -- INSBESONDERE ABWASSERABGABENGESETZ),
Industrie-Wasser-Umweltschutz e.V., Dueren (West Germany).
For primary bibliographic entry see Field 5G.
W75-04950

INCINERATION OF SOLID WASTES,
F. N. Rubel.
Noyes Data Corporation (Park Ridge, New Jersey and London), 1974. 246 p.

Descriptors: *Solid wastes, *Incineration, *Industrial wastes, Design, Operations, Corrosion, Costs, Air pollution, Sewage sludge, Oil wastes, Water pollution sources, *Waste treatment, Beaches, Oil spills, Paints, Plastics, Rubber, Textiles, Disposal, Sludge disposal, Wastes, Ultimate disposal, Air pollution, Treatment facilities, Equipment.
Identifiers: Melt-Zit incinerator.

This compilation of federally sponsored studies reviews and discusses the design, operation, corrosion, costs, air emission control, and special applications of refuse incinerators, including the combustion of sewage sludges, oil refinery wastes, and carbonaceous industrial wastes (from paint, plastic, rubber, and textile production), the restoration of oil-contaminated beaches, and the Melt-Zit high-temperature incinerator. (Brown-IPC)
W75-04969

STATUS OF ADVANCED WASTE TREATMENT,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-04983

EFFECT OF CARBON TO NITROGEN RATIO ON ACTIVATED SLUDGE SUBSIDENCE AND DEWATERING CHARACTERISTICS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W75-04987

BETHLEHEM TREATS 80 MILLION GALLONS OF WASTEWATER EACH DAY.
For primary bibliographic entry see Field 5D.
W75-04993

MANAGEMENT OF WASTE FLUIDS IN SALAQUIFERS,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-05191

QUARTERLY PROGRESS REPORT, RESEARCH AND DEVELOPMENT ACTIVITIES, WASTE FIXATION PROGRAM, JULY THROUGH SEPTEMBER 1974,
Battelle-Pacific Northwest Labs., Richland, Wash. Nuclear Waste Technology Dept.
For primary bibliographic entry see Field 5D.
W75-05347

WASTE MANAGEMENT AND TRANSPORTATION TECHNOLOGY DEVELOPMENT, QUARTERLY REPORT, JULY 1974 THROUGH SEPTEMBER 1974.
Atlantic Richfield Hanford Co., Richland, Wash. Research Dept.
For primary bibliographic entry see Field 5D.
W75-05348

5F. Water Treatment and Quality Alteration

CHELANT TREATMENTS PROVIDE MAXIMUM RETURN TO THE PULP AND PAPER INDUSTRY,
Betz Lab., Inc., Trevose, Pa.
J. R. Metcalf, and B. C. Moore.
In: TAPPI 1974 Engineering Conference, Seattle, Washington, October 21-24, 1974, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 145-151. 4 fig, 11 ref.

Descriptors: *Boiler feed water, *Industrial water, *Chelation, *Pulp and paper industry, *Operation and maintenance, *Water treatment, Chemical reactions, Chemicals, Scaling, Corrosion, Fouling, Chemical precipitation, Boilers, Ionization, Metals, Solubility, Costs, Economics, Water pollution sources, Pre-treatment(Water), Water quality control, Quality control, Water purification.

The technical principles behind the use of chelants for the treatment of boiler feedwater are reviewed. The chelant forms a soluble complex through absorption of the ionized metals within its chemical structure, thereby preventing these metals from precipitating out on the evaporative boiler surfaces. Case histories are cited to illustrate the merits of chelant programs to paper mill boiler systems. (Witt-IPC)
W75-04940

HANDBOOK OF ENVIRONMENTAL CONTROL. (1) AIR POLLUTION. (2) SOLID WASTE. (3) WATER SUPPLY AND TREATMENT. (4) WASTEWATER: TREATMENT AND DISPOSAL,
Minnesota Univ., Minne. Div. of Environmental Health.
For primary bibliographic entry see Field 5D.
W75-04945

THE CHEMICAL TREATMENT OF COOLING WATER,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 5D.
W75-04964

DESIGN OF A MULTILAYER FILTER FOR USE IN THE WATER TREATMENT INDUSTRIES,
Imperial Coll. of Science and Technology, (England). Dept. of Public Health Engineering.
G. T. J. Fox, and S. M. Metcalf.
Filtration and Separation, Vol 11, No 4, p 383-386, July/August, 1974. 2 fig, 1 tab, 4 ref.

Descriptors: *Water treatment, *Filters, Filtration, *Design, *Waste water treatment.
Identifiers: Multilayer filters, Grain size, *Backwashing.

The inherent size grading resulting from backwashing a bed of material of the same density but slightly differing sizes is a major problem in the improvement of water filters of the 'packed bed' variety. It is not feasible to obtain large quantities of single sized grains, and a size gradation of small-to-large in the direction of filtration is found in a sand bed after backwashing. The effect of this on the operating efficiency of such a water filter is discussed, and the way in which these problems can be overcome by the use of a multiplicity of layers composed of materials of differing sizes and densities is outlined. While a filter with a gradation of large-to-small in the direction of filtration, produced by using more than one material, may be more efficient, it is also much more difficult to design. The best method of design is one which uses maximum removal by the center layer. Possible flow rates are also discussed. (Prague-FIRL)
W75-04979

COLUMNS REPRESENTING MOUND-TYPE DISPOSAL SYSTEMS FOR SEPTIC TANK EFFLUENT: II. NUTRIENT TRANSFORMATIONS AND BACTERIAL POPULATIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5D.
W75-04981

ARSENIC CONTAMINATION OF DRINKING WATER AND FOOD-STUFFS CAUSING ENDEMIC CHRONIC POISONING,
For primary bibliographic entry see Field 5C.
W75-05177

MANGANESE REMOVAL FROM POTABLE WATER,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
R. S. Ingols, and T. F. Craft.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 957, $3.75 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC-1874, November 1974. 27 p, 8 fig, 2 tab, 3 ref. OWRT B-071-GA(1). 14-31-0001-3871.

Descriptors: *Manganese, Impounded waters, Diffusion rates, *Water treatment, *Oxidation, Potable water, Organic matter, Water supply, Oxygen demand, Ions, Chemical precipitation.
Identifiers: Manganese dioxide precipitation, Manganese oxidation.

To understand the problems which occur in removing manganese from potable water, two approaches have been followed: (1) a continuing study of the factors which affect the concentration of manganese in impounded water and (2) the effect of soluble organic substances upon the removal processes. The studies have shown that: (1) The concentration of manganese in two potable water supplies is directly correlated with the concentration of organic matter in the sample, (2) the removal of manganese by oxidation can occur only after satisfying the oxidant demand of the organic matter or other interfering substances such as sulfide, (3) the vertical diffusion rate of the manganese is slightly influenced by the presence of an excess of hydrogen ions. Because a high concentration of the manganous ions was used for better accuracy at distant points, the pH of the concentrated manganous nitrate cannot be raised without precipitating manganous hydroxide. The diffusion rates of the manganous nitrate and potassium nitrate are similar enough to indicate that the soluble particle of manganese probably contains only one atom of manganese, (4) the rate of vertical diffusion does not explain the concentrations of manganese found in lake hypolimnetic waters: lateral diffusion from the sides of the lake bottom plus any mechanical agitation from natural phenomena or power generating operations are responsible for an observed high diffusion rate in lakes.
W75-05270

HIGH-RATE FILTRATION FOR TORONTO'S ISLAND WATERWORKS,
R. G. Tredgett.
Water and Pollution Control, Vol 112, No 8, p 37-39, 41, August, 1974. 2 tab.

Descriptors: *Water treatment, Water purification, *Water quality, Water supply, Chlorination, *Coagulation, *Filtration, Chemical precipitation, Costs, Lake Ontario, *Canada, Treatment facilities, Waste water treatment.
Identifiers: *Toronto(Canada).

Since 1917, Toronto's old Island Filtration plant has treated water by coagulation followed by direct filtration. Alum is added at pump suctions to raw water which is then pumped to the filters without flocculation and settling. The plant performs acceptably confirming the idea that good quality raw water can be filtered with minimum treatment. This fact was of significant consideration in the design of new facilities. Records of raw water quality kept by the plant were analyzed. Lake Ontario was shown to be generally a source of good quality raw water with isolated occurrences of high turbidity. Two pilot studies were performed early in 1971. The mechanical mixing required to produce a satisfactory floc for direct filtration and the direct filtration of coagulated water at rates not less than 4 g/sq ft/min were examined. The investigation resulted in the recommendation to build a plant employing rapid coagulation followed by direct filtration. Plans include immediate expansion to 60 mgd capacity and further extensions to replace the old plant when the demand increases. Chemical treatment will include alum, chlorine, sulphur dioxide, and fluoride which have been used previously. Improvements of chemical treatment include prechlorination, addition of ammonia hydroxide and polyelectrolyte filter aids. The estimated cost for construction of the first phase of the extensions is $9.0 million. (Orr-FIRL)
W75-05324

VIRUS REMOVAL BY DIATOMACEOUS EARTH FILTRATION,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
M. Chaudhuri, P. Amirhor, and R. S. Engelbrecht.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE4, p 937-953, August, 1974. 9 fig, 1 tab, 34 ref.

Descriptors: *Diatomaceous earth, *Viruses, *Filters, *Filtration, Potable water, *Water treatment, Evaluation, Municipal water, Waste water treatment.
Identifiers: Cationic polyelectrolyte, Flux calcined.

Diatomaceous earth filters have been increasingly employed by municipalities for water filtration, and their effectiveness in removing viruses is evaluated. Previous research in this area is reviewed. Methods and materials used in the experimental study of the effectiveness of DE Filter media (flux-calcined) in virus removal, the ability of polyelectrolyte coated DE filter media to remove viruses, and the influence of certain operational parameters on virus removal by DE filtration were discussed and results analyzed. It is concluded that DE filter media coated with water soluble cationic polyelectrolyte can efficiently remove virus particles. (Nelson-FIRL)
W75-05330

5G. Water Quality Control

A PRACTICAL APPROACH TO WATER QUALITY MANAGEMENT PLANNING,
Oklahoma Univ., Norman.
H. S. Peavy.
Available from Xerox University Microfilms, Ann Arbor, Mich. 48106, Order No. 74-21, 986. Ph. D. Thesis, 1974, 276 p.

Descriptors: *Water quality control, *Planning, *Water pollution control, *Model studies, Effluents, Standards, Monitoring, Waste water disposal, *Oklahoma.

An approach to water quality management planning is presented which provides for the protection of water quality without placing undue stress on state agencies planning and monitoring resources. The approach is designed to meet the requirement of federal and state statutes on water pollution control. A model plan was prepared for a river basin in Oklahoma using data available through the state pollution control agencies and local governments. The plan included: a description of the natural characteristics which would aid in understanding the problems relating to natural quantity and quality of the waters within the particular basin; an assessment of the current quality of the basin's surface waters and an analysis of the waste load presently imposed; and, the selection of two models which appeared to sufficiently represent waste assimilative characteristics and which required data that could be easily obtained. The models were calibrated by field studies to more closely approximate reactions in Oklahoma streams and then were used to estimate the maximum amounts of waste which each discharger can release into the receiving stream without violating the water quality standards. (Orr-FIRL)
W75-04857

SOUTHERN TIER EAST REGION, BROOME-TIOGA COUNTIES, NEW YORK COMPREHENSIVE DRAINAGE STUDY, REPORT SUMMARY,
For primary bibliographic entry see Field 4A.
W75-04858

PLAN OF STUDY, YAKIMA RIVER BASIN, TASK III REPORT FOR THE YAKIMA BASIN WATER QUALITY MANAGEMENT PLAN,
CH2M/Hill, Bellevue, Wash.
For primary bibliographic entry see Field 6G.
W75-04865

FRAMEWORK FOR THE PLAN OF STUDY, YAKIMA RIVER BASIN, TASK I REPORT FOR THE YAKIMA BASIN WATER QUALITY MANAGEMENT PLAN,
CH2M/Hill, Bellevue, Wash.
For primary bibliographic entry see Field 6G.
W75-04866

ANALYTICAL METHODS MANUAL - MANUEL DES METHODES ANALYTIQUES,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W75-04870

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO 1: STATISTICS ON THE USE OF PEST CONTROL PRODUCTS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
J. N. Thomson.
Canada Centre for Inland Waters, Report No 35, Burlington, Ontario, Canada, 1973, 54 p, 2 fig, 22 tab, 2 append.

Descriptors: *Pesticides, *Distribution, *Statistics, Surveys, *Data collections, Insecticides, Herbicides, Fungicides, Rodenticides, Seed treatment, Canada, Pest control.

Statistics on the use and sales of pest control products in Canada are reviewed. The various data are described and critically evaluated in terms of their potential usefulness to researchers. Provincial and federal sources of data are appraised and an overview of the pest control market and its changes is provided from the year 1947 through to 1971. Appendices contain tables of the more significant data. The first appendix tabulates national sales figures for the study period, while the second deals with provincial figures for various pesticides. (Environment Canada)
W75-04880

IMPACT OF DETERGENT PHOSPHATE REDUCTIONS ON WATER QUALITY,
State University Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W75-04895

STORMFLOW PRODUCTION FROM PERMEABLE UPLAND BASINS,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2A.
W75-04925

ENVIRONMENT U.S.A.: A GUIDE TO AGENCIES, PEOPLE, AND RESOURCES.
For primary bibliographic entry see Field 6G.
W75-04946

ENVIRONMENTAL PROTECTION IN THE FINNISH PULP AND PAPER INDUSTRY (UMWELTSCHUTZ IN DER FINNISCHEN ZELLSTOFF- UND PAPIERINDUSTRIE),
Finnish Pulp and Paper Research Inst., Helsinki.
W. Jensen.
Das Papier, Vol 28, No 10A, p V110-V119, Oct 1974.

Descriptors: *Water pollution control, *Pulp and paper industry, Water supply, Water utilization, Legislation, Water quality control, Pollution abatement, Costs, Financing, Air pollution, Research and development, Research facilities, Foreign research, Foreign countries, Europe, Pulp wastes, Water quality standards.
Identifiers: *Finland, Finnish Pulp and Paper Research Institute.

The Finnish water supply is described along with its utilization. The provisions of legislation governing this field and the organization of water protection are discussed. The structure and production of the Finnish pulp and paper industry are considered, sketching the development and the current status of effluent loads. A survey is given of measures adopted by the mills and of plans made by the National Board of Waters. There is a brief account of the total costs arising from water protection and their financing, and a discussion of air protection. Finally, there is a survey of research in these fields at the Finnish Pulp and Paper Research Institute, with a summary of work concluded and in progress. (Ward-IPC)
W75-04949

NEW DEVELOPMENTS IN EFFLUENT LEGISLATION, ESPECIALLY LAWS GOVERNING EFFLUENT DISPOSAL (NEUERUNGEN AUF DEM ABWASSERRECHTS-SEKTOR – INSBESONDERE ABWASSERABGABENGESETZ),
Industrie-Wasser-Umweltschutz e.V., Dueren (West Germany).
K. H. Koster.
Wochenblatt fur Papierfabrikation, Vol 102, No 16, p 594, 596, August 31, 1974.

Descriptors: *Legislation, *Waste water disposal, Foreign countries, Europe, Law enforcement, Water quality control, Water quality standards, Regulation, Water policy, Water pollution, Water pollution control, Water quality, Legal aspects.
Identifiers: *West Germany.

On May 10, 1974, the Bundesrat turned down a proposed act regulating effluent disposal, which leaves the West German situation in this regard uncertain. The environmental statement by a special commission for 1974 held that the present bad conditions of German waters is largely due to incomplete enforcement of present laws. It is hoped that improvment in water quality can be attained without too much burden on the taxpayer. It is estimated that no new law could be put into effect before 1977. (Ward-IPC)
W75-04950

INDIGESTER BLACK LIQUOR OXIDATION FOR ODOR CONTROL IN KRAFT PULPING,
North Carolina State Univ., Raleigh. Dept. of Wood and Paper Science.
W. T. McKean, Jr., and J. S. Gratzl.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-228 692, $5.25 in paper copy, $2.25 in microfiche. EPA Report No 650/2-74-005, Jan 1974, 112 p. 10 tab, 28 fig, 37 ref.

Descriptors: *Odor, Control, *Pulp wastes, *Sulfur compounds, *Oxidation, *Hydrogen sulfide, *Air pollution, Air pollution effects, Oxygen, Costs, Operating costs, Pollutants, *Pollution abatement, Chemical reactions, Kinetics, Efficiencies, Inhibition, Yield.
Identifiers: *Black liquor, Kraft pulping, Methyl mercaptan(Methanethiol), Dimethyl disulfide, Pulp yield.

Laboratory studies were carried out to determine the major reaction paths, key inhibition reactions, and kinetics of methyl mercaptan and dimethyl disulfide during oxidation of black liquor. The studies help explain the low oxidation efficiencies with respect to hydrogen sulfide, methyl mercaptan, and dimethyl disulfide during black liquor oxidation at 60-90 C. and suggest that high temperature oxidation would be more efficient. Softwood and hardwood black liquors were oxidized at 80-170 C. Oxidation at 100-120 C resulted in efficient oxidation of all three malodorous compounds with no liquor reversion during subsequent storage and distillation. Oxygen consumption was about 125% of theoretical below 140 C, but increased to about 200% at 170 C. The application of this approach to batch and continuous digester systems is discussed. Preliminary work showed that injection of small amounts of oxygen into the liquor circulation line during the early stage of pulping increased pulp yield by 1-3%, depending on the final pulp kappa number. If this yield increase could be obtained in combination with in-digester black liquor oxidation, the net costs for odor control in kraft mills using batch digesters would be very attractive. (Witt-IPC)
W75-04952

WATER CONSERVATION AND FIBER ECONOMY,
Thames Board Mills Ltd., Purfleet (England).
For primary bibliographic entry see Field 3E.
W75-04956

THE FEDERAL WATER POLLUTION CONTROL ACT AND FORESTRY,
National Forest Products Association, Washington, D.C.
B. C. Grefrath.
Journal of Forestry, Vol 72, No 12, p 757-759, Dec, 1974. 10 ref.

Descriptors: *Federal Water Pollution Control Act, *Forestry, *Water quality, *Forest management, Legislation, Water quality control, Water pollution control, State governments, Regulation, Federal governments.

The Federal Water Pollution Control Act of 1972 places responsibility for water pollution control in forest management at the state level, but the Environmental Protection Agency exercises significant influence over state programs. The development of state forest practice acts is suggested as a method for regulating forest water quality. (Sykes-IPC)
W75-04957

STUDY OF EFFLUENT DISCHARGE (K VOPROSU ISSLEDOVANIYA REZHINOV VODOOTVENDENIYA),
A. I. Shishkin, and M. Ya. Krupnik.
Trudy Leningradskogo Tekhnologicheskogo Instituta Tsellyulozno-Bumazhnoi Promyshlennosti, No 31, p 53-64 plus 2 plates, 1973. 4 fig, 1 tab, 4 ref.

Descriptors: Natural streams, *Water quality, *Effluents, *Mathematical models, *Treatment facilities, Water pollution sources, Industrial wastes, Pulp wastes, Water pollution, Pollutants, Waste water treatment, Costs, Water purification, Mathematical studies, Analog models, Water quality control, Biochemical oxygen demand, Water pollution control, Water pollution effects, Equations, Capital costs, Effluents, Self-purification, Waste assimilative capacity.
Identifiers: *Nara River(USSR).

The construction of effluent treatment plants constitutes up to 5% of the total capital investments in the pulp and paper industry, but even with the most modern plants the degree of purification achieved usually does not exceed 85%. According to literature data, the relative cost of purification increases with decreasing pollution load. Thus, if the cost of BOD reduction from 200 to 20 mg/liter is taken as 1, its reduction from 20 to 2 mg/liter will cost 10. For optimum solution of the problems of purification and discharge of effluents, the costs of construction and operation of treatment plants must be taken into consideration, as well as deterioration of the water quality in waterways where insufficiently purified effluents are discharged. Assuming that proper procedures are used, natural waters could act as a second purification stage. This requires suitable methods for calculating the quality transformations of water receiving partially purified effluents. The process is adequately described by a semi-empirical equation of turbulent diffusion. Because there is no general solution of this equation, solutions for particular cases have been used in engineering practice. One such equation has been proposed earlier, based on the assumption of uniform distribution of pollutants across the stream depth and taking into account the inflow rates from the surface and the bottom. An approximate solution of this equation is given. Calculations made on the basis of this model are compared with experimental data on water quality transformations in the Nara River. The satisfactory agreement obtained confirm the correctness of this method. (Stapinski-IPC)
W75-04965

WORLD DIRECTORY OF ENVIRONMENTAL RESEARCH CENTERS.
For primary bibliographic entry see Field 10D.
W75-04971

CONCEPT DEVELOPMENT OF A FREE VORTEX OIL RECOVERY SYSTEM,
Scientific Associates, Inc., Santa Monica, Calif.
E. B. Nebeker, and S. E. Rodriguez.
Available from the National Technical Information Service, Springfield, Va, 22161 as AD-777 024, $4.25 in paper copy, $2.25 in microfiche. May, 1973. 180 p, 38 fig, 7 tab, 24 ref, 6 append.

Descriptors: Oil spills, *Pollution abatement, Research and development, Model studies, *Water pollution control, Pollutants, Technology, Equipment, *Oil pollution.
Identifiers: *Free Vortex, *Oil spill recovery, Oil spill clean-up.

A free vortex system has been developed for use in recovering oil spilled under high sea conditions. Free vortex skimming is applicable under these conditions: oil films one inch thick or less, operation while stationary and in currents up to 0.75 knots, and severe Sea State 7 waves. The principle involves the production of two flows on and near the surface of the water; surface oil is brought inwards to the vortex and then concentrated as an oil packet, and a recovery pump intake can then remove the oil with little water. Efficiency of the model varied between 10 and 46 percent over the range of the thickness of the oil tested, 1/16 to one inch. A recovery rate of 110 gpm was achieved. Higher rates of recovery are possible if the pump size is changed. (Orr-FIRL)
W75-04977

A LOOK AT THE NATIONAL PERMIT PROGRAM,
J. Ziemba.
Industrial Wastes, Vol 22, No 3, p 44-45, May-June 1974.

Descriptors: *Water pollution control, *Legislation, Water discharge, *Permits, *Federal Water Pollution Control Act, Water permits, Water quality control, Legal aspects.
Identifiers: Water Pollution Control Act of 1972, *Zero discharge.

The Water Pollution Control Act of 1972 (P.L.92-500) is cited as a significant basis for future water pollution legislation, providing a workable framework for effective safeguards by means of which a situation of 'zero discharge' may be attained. A focal point of P.L.92-500, the National Pollutant Discharge Elimination System, would require a permit in order to discharge any type of pollutant. The permit program encourages citizen involvement through public hearings. The program is implemented by the state, with the EPA safeguarding proper enforcement. States without their own program leave permit procedures including application, review, public hearing, approval and the duration of the permit to the Federal agency. The permit program would provide specific guidelines for water pollution control under the Water Pollution Control Act. (Carpenter-FIRL)
W75-04995

WATER POLLUTION AS A CONSTRAINT TO THE DEVELOPMENT OF MARINE FARMING,
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
For primary bibliographic entry see Field 5C.
W75-05013

INFLUENCE OF TRINITROTOLUENE ON MICROORGANISMS AND BIOCHEMICAL SELF-PURIFICATION PROCESSES IN WATER,
For primary bibliographic entry see Field 5C.
W75-05015

PRIMARY, PHYSICAL IMPACTS OF OFFSHORE PETROLEUM DEVELOPMENTS.
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5C.
W75-05032

THE ROLE OF MASS TRANSPORT IN OIL SLICK WEATHERING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W75-05036

'HUMAN-ACCELERATED EUTROPHICATION OF FRESH-WATER LAKES,' PROCEEDINGS OF A CONFERENCE,
Brooklyn Botanic Garden, Ossining, N.Y. Teatown Lake Reservation.

For primary bibliographic entry see Field 5C.
W75-05037

LAKE FORMATION, SEDIMENTATION, CONTROL OF ALGAE, QUESTIONS,
Soil Conservation Service, New City, N.Y.
For primary bibliographic entry see Field 5C.
W75-05039

THE REGISTRATION STATUS OF SIMAZINE FOR SUBMERGED VASCULAR WEEDS AND ALGAE CONTROL IN PONDS,
Ciba-Geigy Corp., Greensboro, N.C.
J. Norton.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 12-16.

Descriptors: *Herbicides, *Aquatic weed control, *Algal control, *Safety, Ponds, Mode of action, Testing procedures, Rates of application, Chlorophyta, Cyanophyta, Application methods, Degradation(Decomposition), Sediments, Fish, Performance, Zooplankton, Food chains.
Identifiers: *Simazine, Princip 80W.

The safety of simazine, trademarked Princep 80W, for algal control and for submerged vascular weeds in lakes and ponds is discussed with a group of citizens concerned with lake preservation. Simazine has been extensively evaluated for a number of years and found to be safer than other materials currently registered. The objectives pursued in 1973 were determination of lowest effective simazine application rates for planktonic algal control; identification of algal species controlled with simazine; phytoplankton monitoring to provide additional information on recurring algal species established in lakes when a simazine concentration is reduced to nonphytotoxic levels; determination of rate of simazine removal from water by algae, photomicrographic documentation of cell wall changes as celluar food reserves are depleted; determination of algistatic algicidal rates of simazine on green and blue-green algae. Changes in nitrate, phosphate, total water hardness and dissolved oxygen levels were all closely monitored. Lake bottom samples were collected to determine the amount of simazine accumulations in sediments. Three criteria were stressed in the evaluation program: fish--possible stress from oxygen depletion; phytotoxicity of treated water on turf and woody ornamentals; monitoring zooplankton and other food chain organisms, which either increased or were not reduced in treated lakes. (See also W75-05037) (Jones-Wisconsin)
W75-05040

HISTORY OF AQUATIC HERBICIDES, BIOLOGICAL CONTROL, PRACTICAL ASPECTS OF THE USE OF CHEMICALS IN WATER WEED CONTROL,
Resource Management, Inc., Freehold, N.J.
R. Younger.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 17-18.

Descriptors: *Aquatic weed control, *Herbicides, Mode of action, *Biocontrol, Systemics, Sodium arsenite, 2,4-D, 2,4,5-T, Zoning, Diquat, Copper sulfate, History.
Identifiers: Contact herbicides.

Herbicide use was begun in 1924 based on Donald Domogolla's doctorate thesis entitled, 'The use of sodium arsenite to control aquatic weeds.' After World War II systemic herbicides, such as 2,4-D and 2,4,5-T, were introduced. These materials work under a premise that when sprayed on plants, they are translocated throughout the entire vascular system from the terminal bud to the last root hair. Sodium arsenite is a contact herbicide which differs from systemic herbicides in that it only operates down to the muck line of the lake bottom or the hydrosoil, where most of these materials are played out and become an integral part of the lake bottom. Contact herbicides are such chemicals as endosal, diquat, copper sulphate, and arsenite. These materials are applied to the water as a seasonal control method. Biological controls are becoming more and more prevalent, especially in the Southeast. Aquatic weed-control chemicals are only a stop-gap method to the problem in lieu of substitutes. This presentation was directed to a group of citizens concerned with lake quality and preservation. (See as W75-05037) (Jones-Wisconsin)
W75-05041

LAKE DREDGING OPTIONS AND MECHANICAL WATER WEED HARVESTERS,
Folsom Marine Service Corp., Plymouth, N.H.
R. Folsom.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 18-21.

Descriptors: *Lakes, *Dredging, *Mechanical equipment, Bottom sediments, Management, Eutrophication.
Identifiers: *Lake rehabilitation.

The method of lake rehabilitation--chemical treatment, aeration, or mechanical techniques--depends on the lake's intended use and local conditions. Conventional equipment, such as a bulldozer or a similar piece of equipment is used wherever possible because it is least expensive. In instances where specialized equipment must be used, the 'Terra Marine Scoop' is effective in removing sediment, root systems, stumps, rocks, trash, etc. It is a truck-mounted dredging unit and very portable. A modified form can reach 1200 feet and can generate a line-pull of up to 21,500 pounds. Its one restriction is that it does not pick up the dredged material which must be loaded onto trucks for hauling to a spill area. The 'Mud Cat' is another specialized piece of equipment; it is a small portable hydraulic dredge with maximum operation depth of 15 feet. A 'Mud-Cat-10' is also available and has a maximum operating depth of 10-1/2 feet. With proper planning, effective use of specialized equipment and continued good water management, natural water reserves can be saved and maintained for recreation use. This description was directed to a group of citizens concerned with lake preservation and rehabilitation. (See also W75-05037) (Jones-Wisconsin)
W75-05042

RESTORATION OF EUTROPHIC LAKES BY ARTIFICIAL HYPOLIMNETIC OXYGENATION,
Union Carbide Corp., Tarrytown, N.Y. Aquatic Environmental Sciences.
For primary bibliographic entry see Field 5C.
W75-05043

PUBLIC HEALTH REQUIREMENTS, SEWAGE DISPOSAL SYSTEMS, PERMITS REQUIRED FOR CHEMICAL TREATMENT OF AQUATIC VEGETATION, AUTHORIZED CHEMICALS, DREDGING PERMITS, SOURCES OF LAKE ENRICHMENT, BUILDING REGULATIONS,
Westchester County Dept. of Health, White Plains, N.Y. Div. of Environmental Health Services.
C. Weber.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 34-38.

Descriptors: *Public health, *Sewage disposal, *Chemcontrol, *Permits, Aquatic weed control, Dredging, Water pollution control, *New York, Septic tanks, Building codes.
Identifiers: Westchester(NY), Teatown Lake(NY).

Certain legal requirements must be observed in New York State before eutrophication control methods are undertaken. Part 327 of the rules and regulations promulgated by the State Department of Environmental Conservation provides that no person, including individuals, corporations, associations, organizations and so forth shall treat a lake or any body of water for purposes of control or elimination of aquatic vegetation by chemicals without first obtaining a permit. The regulation provides that the department can review and evaluate applications and issue permits but specifically states that the permit issuing official shall not make recommendations on the method, use, handling or efficiency of the chemical to be employed and the treatment method. Any permit that is issued will specify the type of chemical, the quantity, and the dates on which it can be applied. With respect to treatment involving dredging of lakes, the state has rules and regulations for the protection of streams which apply to such operations. Thes presentation was directed to a group of citizens concerned with lake preservation. (See also W75-05037) (Jones-Wisconsin)
W75-05044

LAND USE AND ZONING, SEPTIC EFFLUENTS AND THE RESPONSIBILITY FOR ADEQUATE CONTROL,
Yorktown School System, Yorktown Heights, N.Y.
R. Knabel.
In: 'Human-accelerated Eutrophication of Freshwater Lakes,' proceedings of a conference, December 1973, Teatown Lake Reservation, Brooklyn Botanic Garden, Ossining, New York, p 39-40.

Descriptors: *Land use, *Zoning, *Septic tanks, Sewage effluents, Control, *New York, Eutrophication, Regulation, Sewage disposal, Subsurface drainage, Groundwater, Water pollution sources.
Identifiers: Real estate.

Cultural eutrophication is really a function of land use and development around lakes. The problem becomes a question of zoning, a question of real estate interests and a question of regulation and control within the town or the area that the lake is located. Many of these areas are now being converted to year-round use, and almost all of them are still operating on their part time sewage disposal systems. The biggest problem with the lakes in the Westchester County, New York, area now is sewage effluent or septic effluent reaching the lakes, thus providing the nutrient material for plant growth, for turbidity, and all the other things that are associated with a eutrophic lake, most of which are very undesirable. Eutrophication is encouraged by the approach that is taken to land development or by not providing or requiring the necessary safeguards when these areas go through a conversion process. The relationship between subsurface disposal methods and the ground water table and the inevitability of septic nutrients getting into the water body and creating the eutrophic situation is ignored. This presentation was directed to a group of citizens concerned with lake quality and preservation. (See also W75-05037) (Jones-Wisconsin)
W75-05045

COMMENTS ON US EPA PROPOSED CRITERIA FOR WATER QUALITY,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
G. F. Lee, J. Hassett, J. Lopez, M. Piwoni, and R. Plumb.
Occasional Paper No 1, April 1974. 31 p, 21 ref.

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, *Water quality standards, *Legislation, Chemicals, Organic compounds, Toxicity, Analytical techniques, Bioassay, Sampling, Toxins, Potable water, Metals, Sea water, Freshwater, Sewage effluents.

These comments point out types of problems that exist with many of the EPA proposed criteria. The tone of this critique is that many of the criteria should not be adopted as water quality standards since they would be too strict. All funds spent for water pollution control should be directed toward solving critical existing or potential problems. Discussed in particular are evaluation of chemical particulate species, problems with aquatic bioassay, bioassay of organic compounds, sampling and analytical problems, and the effluent mixing zone concept. Comments on specific proposed criteria include phosphorus, carbon adsorbable organics, chlorinated pesticides and chlorophenoxy herbicides in drinking water. The criteria for color, oils, phthalate esters, PCBs and pesticides in freshwater are evaluated. The limits of toxicants, including ammonia, cyanide, sulfides, dissolved gases, chlorine, copper, cadmium, lead, mercury, and zinc in freshwater and the toxic limits of fluoride, aluminum, arsenic, copper, chromium, cadmium, lead, manganese, mercury, nickel and zinc in marine waters are elucidated. (Jones-Wisconsin)
W75-05052

CONTROL OF AQUATIC WEEDS FROM WATER BODIES USING GRASS CARP,
Central Public Health Engineering Research Inst., Madras (India). Zonal Centre.
For primary bibliographic entry see Field 4A.
W75-05058

EXPERIMENTAL DREDGING TO CONVERT LAKE BOTTOM FROM ABIOTIC MUCK TO PRODUCTIVE SAND,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
R. L. Wilbur.
Water Resources Bulletin, Vol 10, No 2, p 372-383, 1974. 5 fig, 2 tab, 10 ref.

Descriptors: *Environmental control, *Dredging, *Benthos, *Lake beds, Productivity, Sands, Food chains, Fisheries, *Florida, Abiotic environment, Technology, Cost analysis, Mechanical equipment.
Identifiers: *Lake rehabilitation, Muck removal, Lake bottom redistribution, Trout Lake(Fla), Lake Charlton(Fla).

One major environmental factor contributing to gamefish reduction has been loss of productive lake bottom. Restoration of this link to gamefish food chain is a potential tool for revitalizing lake fisheries. Two eutrophic Florida lakes with extensive muck deposits were selected for implementing experimental bottom alterations, and two different techniques were selected which would reduce muck surface area and increase sand surface area. Preliminary results indicate benthos will be increased in areas converted to sand. Muck removal with a specially designed dredge was tested in Trout Lake. It removed 41,650 cu. yds. of muck and exposed 17 acres of sand bottom, but 10 of these acres developed thin muck layers which proved too soft to be picked up. Consequently, only 7 acres were satisfactorily converted. Bottom redistribution with a suction-type dredge was tested in Lake Carlton, converting 14 acres from muck to sand. Sand covered with muck was pumped from midlake areas to more peripheral areas where water depths were 11 to 13 feet and muck layer about 1.5 feet deep. The bottom was built up to an elevation above the previous muck elevation. Several methods for depositing the sand on the lake beds were tested. (Jones-Wisconsin)
W75-05060

ESTIMATING WATER QUALITY BENEFITS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
D. L. Jordening.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402, price $1.50. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-74-014, August 1974. 82 p, 11 tab, 131 ref, 2 append. EPA Project 21-AQJ-05. Contract 68-01-0744.

Descriptors: *Economic efficiency, *Water quality, Cost-benefit analysis, *Benefits, *Estimating, *Beneficial use, Evaluation, Assessment, *Research priorities.

A state of the arts summary concerning estimating water quality associated benefits is presented. This summary is viewed as a useful administrative tool to those that have been assigned the task of directing current and future research activity. Insofar as possible, this summary is presented by specific pollutants by beneficial use, devoting special attention to hypothesized and documented use-quality relationships. A discussion of the economic quantification of these relationships is also included. The beneficial uses considered include recreation, esthetics, property values and ecology with only limited attention devoted to water quality associated health and production impacts. Specific references and methodologies are discussed with the ultimate objective of providing a state of the arts assessment by beneficial use. This assessment was also useful in deriving conclusions concerning research priorities and possible results of future water quality related research. (EPA)
W75-05068

CARRYING CAPACITY IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W75-05069

CROP INSURANCE AND INFORMATION SERVICES TO CONTROL USE OF PESTICIDES,
Abt Associates, Inc., Cambridge, Mass.
J. A. Miranowski, U. F. W. Ernst, and F. H. Cummings.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, price $1.55. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-74-018, September 1974. 85 p, 4 fig, 8 tab, 24 ref, 2 append. EPA Program Element 1BA030. Contract 68-01-1888.

Descriptors: *Pesticides, *Information exchange, Insecticides, Cotton, Crop production, Management.
Identifiers: *Pest control, Implementation strategies, *Crop insurance.

This study analyzes the relative effectiveness and efficiency of pest information and crop insurance programs in encouraging farmers to use potentially harmful pesticides more sparingly by eliminating wasteful applications. Possibly excessive applications of pesticides can be attributed to poor timing of applications and to the risk-averse behavior of farmers. Focusing on insecticide use in cotton production as a major policy problem, the study employs a decision-theoretic framework to simulate the farmer's pesticide use decisions under alternative program options and subsidy levels. To the extent possible, empirical data are analyzed to complement the findings of the simulation analysis. The theoretical and empirical analyses in this study indicate that pest information programs are potentially more effective than crop insurance programs in reducing insecticide usage. These reductions from compliance with pest control recommendations provided by information programs are associated with economic gains by the farmer. Both the simulation experiments and available evaluations of the USDA Pest Management Program indicate that a maximum insecticide use reduction of 30 percent can be achieved through information programs. Subsidies to such programs appear an effective means to encourage adoption by farmers, at least in the initial phases. (EPA)
W75-05070

EVALUATION OF ADJUSTMENT ASSISTANCE PROGRAMS WITH APPLICATION FOR POLLUTION CONTROL,
Bowdoin Coll., Brunswick, Maine.
A. M. Freeman, III.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Environmental Protection Agency, Ecological Research Series Report, EPA-600/5-74-029, September 1974 82 p, 4 fig, 1 tab, 45 ref, append. EPA Project R-801481.

Descriptors: *Resource allocation, *Pollution abatement, Water pollution control, Evaluation, Economics.
Identifiers: *Pollution control, *Adjustment assistance policies.

Adjustment assistance policies for pollution control are examined. The adjustment or economic resource reallocation problem which arises when pollution control requirements are imposed on a firm or industry is described. Micro and macro aspects of adjustment are examined. U.S. trade adjustment assistance policies are examined. The possible application of adjustment assistance concepts to the problem of pollution control is discussed. Factors to be considered in designing a program are described. The major elements of a model adjustment assistance program are presented. (EPA)
W75-05074

ANALYSIS OF COST SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
H. E. Marshall, and R. T. Ruegg.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Environmental Protection Agency, Ecological Research Series, Report, EPA-600/5-74-031, November 1974. 137 p, 12 fig, 11 tab, 34 ref. EPA-IAG D4 H 374.

Descriptors: *Pollution abatement, *Cost sharing, *Federal project policy, Municipal wastes, *Treatment facilities, *Federal Water Pollution Control Act, Institutional constraints, Legal aspects, Legislation, Regulation.

This study evaluates existing cost-sharing programs for wastewater pollution abatement as described in the Federal Water Pollution Control Act Amendments of 1972, describes alternative cost-sharing programs that provide improvement in terms of national efficiency and equity criteria as defined herein, and suggests related areas for further research. Emphasis is on how Federal cost sharing biases communities in favor of certain kinds of techniques. The approach is to describe the current cost-sharing programs for both plant and nonplant techniques; to examine cost-sharing, legal, and other institutional biases against certain techniques; to analyze efficiency and equity effects of alternative cost-sharing programs; and to describe the incentive effects of cost sharing on nonfederal interests with respect to their choices among abatement techniques. Findings are that more efficient abatement will result if the same percentage cost share applies to all plant and nonplant techniques of abatement; the same percentage also applies to all categories of cost (e.g., capital, land, operation and maintenance) for a given technique; the same percentage applies to

large and small communities; institutional constraints on the selection of nonplant techniques are removed; and if the program provides for Federal cost sharing of every abatement technique that is technically viable. (EPA)
W75-05076

BIBLIOGRAPHY OF WATER POLLUTION CONTROL BENEFITS AND COSTS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
S. G. Unger, and D. L. Jordening.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Environmental Protection Agency, Ecological Research Series Report, EPA-600/5-74-028, October 1974, 181 p. 1B1030/ROAP 20aab-02. EPA 68-01-6237.

Descriptors: Water quality, *Benefits, Costs, Economics, Environment, Pollution, *Water pollution control, *Bibliographies, *Cost-benefit analysis, Pollution abatement.

This computer-listed bibliography includes approximately 3,000 references to environmental quality management issues. The primary selection criteria for including the sources referenced was that the citation pertains to water pollution control benefits and costs. However, numerous listings include more general environmental issues within which water quality problems are embedded. Also, much of the economic cost-benefit analysis research has been conceptually developed and/or applied in resource-use areas other than water. Such concepts were often considered germane to water resources research even though water related applications were not found in the literature search. Therefore, this publication does include selected references outside the water resource research area, per se. The bibliography is arranged alphabetically, by author. Both literature sources and terms used in titles were often abbreviated to conserve space; such abbreviations were defined in the attached glossary. Literature sources included books, journal articles, trade publications, research reports, and unpublished reports pertaining to on-going research within both public and private agencies. (EPA)
W75-05077

EVALUATION OF DRAINAGE FOR SALINITY CONTROL IN GRAND VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, W. R. Walker, Ray S. Bennett, J. E. Ayars, and J. H. Taylor.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.75. Environmental Protection Agency, Technology Series Report, EPA-660/2-74-084, August 1974. 100 p, 26 fig, 15 tab, 28 ref. Program Element 1BB039, EPA Grant S-800278.

Descriptors: *Colorado River, *Deep percolation, Drainage, Irrigation, Irrigation effects, *Irrigation efficiency, Irrigation water, *Return flow, Saline soils, Saline water, *Salinity, Water distribution(Applied), Water loss, Water pollution sources, Water quality.
Identifiers: *Grand Valley(Colo), Irrigation management, *Salinity control, Field drainage.

Irrigation return flows in the Grand Valley of Western Colorado contribute to the serious salinity problems in the Colorado River Basin by carrying large salt loads resulting from contact with local saline soils and aquifers. Since the valley is one of the more significant salt sources, it is a logical area for evaluation of the effectiveness of various salinity control measures. This study has emphasized two on-farm control alternatives, namely, irrigation scheduling and field drainage. This report considers the latter measure. Three farms were extensively studied during the 1972 and 1973 irrigation seasons to identify drainage needs and the effect field relief drainage would have on reducing salinity in the return flows. During the spring of 1973, a perforated plastic pipe drainage system was installed on one of the farms. Each farm was than incorporated into an irrigation scheduling program. The results indicate that while field drainage is effective in skimming water off the top of the water table where salinity concentration are typically 20% - 30% lower, the high costs emphasize the need to reduce seepage losses by lining canals and minimize deep percolation losses through improved on-farm water management in order to minimize the requirements for drainage facilities. (EPA)
W75-05090

DEVELOPMENT OF CLASSIFICATION SCALE FOR CHARACTERIZING BILGEWATERS USED IN EVALUATING OIL REMOVAL TECHNIQUES,
General American Transportation Corp., Niles, Ill. General American Research Div.
P. Budininkas, and G. A. Remus.
Avaalable from the National Technical Information Service, Springfield, Va 22161 as AD-778 929, $4.25 in paper copy, $2.25 in microfiche. Report No CG-D-75-74, January 1974. 59 p, 22 fig, 8 tab. DOT-CG-32,521-A.

Descriptors: *Emulsions, Oil, *Oily water, *Oil pollution, Laboratory equipment, Instrumentation, Laboratory tests, Measurement, Emulsifiers, Emulsions, *Separation techniques, Water pollution control, Pollution abatement.
Identifiers: *Bilgewater, Demulsification.

A method was developed for empirically classifying bilgewaters by observing the rate of oil separation from water-oil emulsions. A manually operated, compact demulsification measurement instrument for monitoring oil separation from emulsions containing oil concentrations in the 0.05 to 0.15% range, considered typical for bilgewaters, was developed and tested. The rate of demulsification is followed by reading the volume of oil separated from the test emulsion directly and visually in the instrument. The demulsification behavior of artificial bilgewater emulsions was determined by using the demulsification measurement instrument. The emulsions were prepared from oils considered representative of those in use on marine vessels, namely diesel fuel, hydraulic, and lubricating and detergent-lubricating oils, mixed with either deionized, fresh, or saline waters. These measurements resulted in a series of curves showing the amount of oil separated versus time, with a separate and distinctive curve for each of the emulsions tested. The series of experimentally observed demulsification curves for each of the water-oil emulsions tested established a classification scale showing relative oil separation behavoir. This classification scale, in conjunction with tests obtained with the demulsification measurement instrument, can be applied to: (1) characterizing actual bilgewaters according to their demulsification behavoir, and (2) preparing artificial bilgewaters with known properties and separation characteristics. (Sims-ISWS)
W75-05091

ARTIFICIAL SEA SLICKS: THEIR PRACTICAL APPLICATIONS AND ROLE IN FUNDAMENTAL RESEARCH,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-05092

A REVIEW OF THE LITERATURE CONCERNING THE STEEL INDUSTRY AND POLLUTION. PART 1. THE BACKGROUND TO POLLUTION,
British Steel Corp., Sheffield (England). Information Services.
D. G. Brinn.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 290, $3.75 in paper copy, $2.25 in microfiche. Report No SM/BIB/832, June 1974. 24 p, 3 fig, 3 tab, 109 ref.

Descriptors: *Reviews, *Bibliographies, *Industrial wastes, Air pollution, Thermal pollution, Water pollution, Steel, Iron, Industries, Documentation, Information retrieval, Economics, Legislation, Legal aspects.
Identifiers: United Kingdom.

Pollution was defined and the increasing awareness of the problems of pollution was discussed. Developments in pollution legislation, with particular regard to the United Kingdom, were traced and some comparisons were made with the situation in other industrial countries. The effectiveness of the legislation and non-legislative reasons for controlling pollution were dealt with. Pollution levels in the United Kingdom, past, present, and future were outlined and brief reference was made to levels in other countries. Finally, some comments were made on the true economics of pollution control. (Sims-ISWS)
W75-05093

A METHOD FOR THE SEPARATION OF OIL FROM AN AQUEOUS OIL-DETERGENT SOLUTION PRIOR TO IR ANALYSIS,
Naval Ordnance Lab., White Oak, Md.
For primary bibliographic entry see Field 5A.
W75-05098

OIL CONTAMINATED BEACH CLEANUP,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
J. J. Der, and E. Ghormley.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-778 329, $3.75 in paper copy, $2.25 in microfiche. Technical Note N-1337, April 1974. 39 p, 4 fig, 4 tab, 25 ref, 2 append.

Descriptors: *Oil spills, *Oil pollution, *Beaches, Mechanical equipment, Oil, Cleaning, Wastes, Environment, Reviews, Evaluation, *Pollution abatement, Water pollution control.
Identifiers: Beach cleanup.

A review of representative oil spill incidents supplemented by personal and telephone interviews with persons involved in beach cleanup operations as on-scene coordinators or as cleanup operators was made to evaluate cleanup methods suitable for future operations. The selection of procedure and equipment for beach cleanup was found to depend on the amount of oil, the characteristics of the oil as it hits the beach, and the type of beach contaminated. The most effective beach cleanup procedures and equipment were identified and tabulated in terms of selected beach classifications. Recommendations for future work to remove deficiencies of existing techniques were included. The tables in an appendix summarized major oil spills that occurred in the past in which significant effort was made to remove contamination from the shore area. The procedures used for beach cleanup were briefly described. (Sims-ISWS)
W75-05100

WEATHERING OF OIL AT SEA,
Esso Research and Engineering Co., Linden, N.J. Government Research Div.
For primary bibliographic entry see Field 5B.
W75-05106

GEOHYDROLOGIC RELATIONSHIPS IN WATER POLLUTION,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
J. R. Hyland.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 884,

$8.50 in paper copy, $2.25 in microfiche. EPA-430/1-74r006, July 1974. 93 p, 59 fig, 9 tab, 79 ref.

Descriptors: *Aquifers, *Hydrogeology, *Water pollution, Subsurface flow, Water supply, Surface-groundwater relationships, Geophysics, Discharge(Water), Recharge, Water wells, Aquifer characteristics, *Groundwater movement, Exploration, Water quality control.

A course manual was presented with outlines concerning groundwater quality control. Topics included: principles of geology, soils and groundwater hydrology, aquifer characteristics, technology of evaluating groundwater, geophysical applications, groundwater quality, pollution effects on groundwater, and groundwater recharge. (Visocky-ISWS)
W75-05128

BIBLIOGRAPHIES PERTINENT TO WILDLAND HYDROLOGY,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 10C.
W75-05153

WATER RESOURCES DEVELOPMENT, 1950-1965, AN INTERNATIONAL BIBLIOGRAPHY,
Center of Scientific and Technological Information, Tel Aviv (Israel). Library Services.
For primary bibliographic entry see Field 10B.
W75-05154

EFFECTS OF ECONOMIC DEVELOPMENT UPON WATER RESOURCES (AN INTERINDUSTRY APPROACH TO MODELING ECONOMIC-ENVIRONMENTAL SYSTEMS),
Maryland Univ., College Park. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6G.
W75-05174

PROBLEMS AND OPPORTUNITIES IN INTERDISCIPLINARY RESEARCH: THE MOLYBDENUM PROJECT,
Colorado Univ., Boulder. Dept. of Physics and Astrophysics.
W. R. Chappell.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 696-708, 1 tab, 1 fig, 17 ref. NSF(GI-34814X).

Descriptors: Projects, *Management, *Molybdenum, *Soil-water-plant relationships, *Project planning, Comprehensive planning, Governmental interrelations, Industrial wastes, Trace elements, Pollutant identification.

Some aspects of the development and evolution of the Molybdenum Project were discussed to illuminate some of the problems encountered in interdisciplinary research and in industry and regulatory agency interactions. The report included (1) background of the project; (2) analysis of interactins with external groups, such as governmental agencies and officials and private industry, and (3) short and long-range proposed impacts of the study. In the interaction analysis, the importance of credibility was stressed, and the biggest potential problem was identified as that of surprise. The best approach counseled to deal with the problem of surprise was that of maximum openness with all concerned parties. Uranium and copper mining and livestock management were suggested as areas of short range impact. The most important long-range impact was pictured as the development of techniques that can be generalized to treat other trace elements, as well as experience in university participation in interdisciplinary problem-oriented research. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05298

NATIONAL NEED - AN INDUSTRY VIEW OF RESEARCH,
AMAX Lead and Zinc, Inc., St. Louis, Mo.
M. N. Anderson.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 709-725, 2 tab, 3 fig, 12 ref.

Descriptors: *Lead, *Management, *Industrial wastes, *Investment, *Economic justification, Zinc, Capital, Economics, Econometrics, Mining, Mineral industry, *Missouri.

Lead and zinc industry efforts in reducing pollution in view of economic constraints are cited. The author gave a specific example of the lead industry - University of Missouri RANN effort and research on the interactions of lead and zinc and sulfur dioxide with the environment. A valuable result of this effort was stated as the working together of industry, the university, and government agencies to tune up the control mechanisms. Some pollution control expenditures by a lead mining and smelting company in the New Missouri Lead Belt were quoted. The author also presented his own philosophy of ecology. Capital intensive industries like mining and smelting need long periods of relatively stable operation to recover capital. Therefore, it is necessary to move intelligently in solving pollution problems, and legislative or regulatory dictates may not accelerate the rate of accomplishment. The use of fear motivations in environmental discussions and the interpretation of data from unfamiliar areas were cautioned against. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05299

AN APPROACH TO THE CONTROL OF TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
G. E. Schweitzer.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Commission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 726-731.

Descriptors: *Toxins, *Regulation, *Legislation, *Administrative agencies, Standards, Environmental control, Economics, Industrial wastes, Government, Administration.

The concern of EPA with toxic substances is (1)identification and assessment of the risks associated with the manufacture, distribution, use and disposal of chemicals which could adversely affect health and environmental quality, and (2) practical steps to prevent or mitigate the problems posed by such chemicals. In these efforts, the government can draw on (1) consumer protection statutes, (2) media-oriented statutes, and (3) statutes dealing with a particular phase of the existence or use of a toxic substance. Balancing of the risks with the benefits related to the action is central to the consideration of regulatory options. The proposed Toxic Substances Control Act of 1973 was discussed. It would give EPA new authority for information acquisition and restrictive actions. The role of the researcher in the formulation of national policies aimed at controlling toxic substances was also discussed. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05300

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-05306

PREDICTION OF SUBSOIL ERODIBILITY USING CHEMICAL, MINERALOGICAL AND PHYSICAL PARAMETERS,
Purdue Research Foundation, Lafayette, Ind.
For primary bibliographic entry see Field 2J.
W75-05308

AN EXECUTIVE SUMMARY OF THREE EPA DEMONSTRATION PROGRAMS IN EROSION AND SEDIMENT CONTROL,
Hittman Associates, Inc., Columbia, Md.
M. A. Nawrocki, and G. M. Sitek.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.20. Environmental Protection Agency, Technology Series, Report EPA-660/2-74-073, June 1974. 50 p, 7 fig, 1 tab, 2 ref. Program Element 1B2042 EPA Contract 68-01-0743.

Descriptors: *Aquatic Environment, Construction, *Demonstration watersheds, *Erosion control, *Rainfall-Runoff relationship, *Sedimentation, *Urbanization, Watershed(Basins), *Dredging, *Sediment deposition, *Filtering systems, *Separation techniques, Biology, Channel morphology.
Identifiers: Guidelines, Presentations, *Suspended solids separation, Pond dredging, Grade control.

Highlights are presented of three recently completed programs in the area of sediment and erosion control. These programs were a 'Joint Construction Sediment Control Project, 'Project No 15030 FMZ; a 'Programmed Demonstration for Erosion and Sediment Control Specialists, 'Project No. S800854 (15030 FMZ); and a 'Demonstration of the Separation and Disposal of Concentrated Sediments,' Contract No 68-01-0743. (See W74-11923, W75-05-05311 and W75-05312). The first program demonstrated and developed guidelines for erosion and sediment control in urbanizing areas, the second produced a series of 15 presentations on sediment and erosion control, and the third program consisted of a field demonstration of a system for removing and processing sediments from pond bottoms. (EPA)
W75-05310

PROGRAMMED DEMONSTRATION FOR EROSION AND SEDIMENT CONTROL SPECIALISTS,
Hittman Associates, Inc., Columbia, Md. Environmental and Geosciences Dept.
T. R. Mills, M. A. Nawrocki, and G. R. Squire.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $2.15. Environmental Protection Agency, Technology Series Report EPA 660/2-74-071, p 148, February 1974. 3 fig, 3 tab, 2 ref, 8 append. EPA Program Element 1B2042, Project No S800854 (15030 FMZ).

Descriptors: *Erosion control, *Maryland, Education, Construction, *Sediment control.
Identifiers: Certification plans, *Construction related erosion, *Technical presentations.

A series of technical presentations and a certification plan for erosion and sediment control specialists are presented. Fifteen conventional presentations, complete with visual aids and student handouts, and six audiovisual programs consisting of film strips, taped narration, work books, and instructor's manuals are described. Samples of the presentation materials, designed to provide an effective program for qualifying construction personnel and other persons to pass the certification exam, are included in appendices. Presentations include such topics as: Goal, Objectives and Principles of Erosion and Sediment Control; Erosion and Sedimentation; Control of Sediment

Generated on Construction Sites; Control of Runoff During Construction; Vegetative Soil Stabilization; and Foreman-Inspector Responsibilities. Results of a demonstration to evaluate the conventional presentation approach versus the audiovisual approach are given. Also described is the development of a plan for the certification of on-site erosion and sediment control specialists. (See 74-11923, W75-05310 and W75-05312) (EPA)
W75-05311

DEMONSTRATION OF THE SEPARATION AND DISPOSAL OF CONCENTRATED SEDIMENTS,
Hittman Associates, Inc., Columbia, Md.
M. A. Nawrocki.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-74-072, p 77, June 1974. 12 fig, 15 tab, 3 ref, 4 append. Program Element 1B2042, EPA Contract 68-01-0743.

Descriptors: *Dredging, *Sediment deposition, *Filtering systems, *Separation techniques, Impoundments, Water quality control, Desilting.
Identifiers: *Suspended solids separation, Pond dredging.

A demonstration was conducted of a system for removing and processing sediment from impoundment bodies. A MUD CAT dredge was used to remove the sediment from a pond. The dredged slurry was then pumped through a processing system consisting of a pair of elevated clarifier bins in series, a bank of hydrocyclones, a cartridge filter unit, and a Uni-Flow bag-type fabric filter consisting of 720 one-inch diameter hoses. The MUD CAT proved efficient in removing sediment from the pond bottom without imparting a substantial amount of turbidity to the pond water. The processing system was effective in removing suspended sediment from the dredged slurry. Its effluent averaged 445 mg/l with an average influent suspended solids of 170,300 mg/l. Experiments were also conducted on the use of five-inch diameter hoses on the Uni-Flow filter. These produced better results than the one-inch hoses in that they were not prone to blockage by sediment. (See W74-11923, W75-05310 and W75-05311) (EPA)
W75-05312

CONTROL OF ENVIRONMENTAL IMPACTS FROM ADVANCED ENERGY SOURCES,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 6G.
W75-05313

CALIFORNIA ENVIRONMENTAL QUALITY ACT: INNOVATION IN STATE AND LOCAL DECISIONMAKING,
Center for California Public Affairs, Claremont.
For primary bibliographic entry see Field 6G.
W75-05314

HOW TO INCORPORATE WATER QUALITY AND POLLUTION CONSIDERATIONS INTO THE MODEL OF THE WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05321

LASL WASTE SYSTEM BACKS UP INTO STREET.
For primary bibliographic entry see Field 5D.
W75-05327

TREAT WASTEWATER LIKE DOWNTOWN TRAFFIC,
For primary bibliographic entry see Field 5D.
W75-05329

WASTEWATER COLLECTION (LITERATURE REVIEW),
Nottingham (H.D.) and Associates, McLean, Va.
For primary bibliographic entry see Field 5D.
W75-05335

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

FACILITIES PLAN, ANNEX A, LAS VEGAS/BAY POLLUTION ABATEMENT PROJECT,
Nevada Environmental Consultants, Las Vegas.
Clark County Board of Commissioners, Las Vegas, Nevada, July 1974. 321 p, 31 fig, 71 tab, 37 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Planning, *Urbanization, *Alternate planning, Groundwater mining, Land subsidence, Wastewater treatment, Nevada, Wastewater disposal.
Identifiers: *Las Vegas Wash/Bay, Lake Mead, Clark County(Nevada).

The Facilities Plan presents and evaluates alternative solutions to the problems associated with the discharge of domestic wastewater to Las Vegas Wash and Bay. A recommended project providing advanced wastewater treatment and beneficial reuse of reclaimed wastewater has been selected. Most geologists and engineers who have studied this Valley agree that the groundwater basin has been over-drafted for several years resulting in groundwater depletion and land subsidence. Efforts are being made by State and local agencies to reduce this over-drafting of the groundwater resource. Wastewater now available is a high quality secondary effluent. In 1973, over 80% (43,000 acre-feet) of the Valley's secondary wastewater was discharged to Las Vegas Wash where it mixed with highly saline groundwater discharges. Together these waters were discharged into Las Vegas Bay of Lake Mead. These discharges to the Colorado River system are a source of nutrients, dissolved and suspended solids, and bacteria. The nutrients, particularly phosphorus, have been identified as the principle cause of excessive summer algal growth experienced in Las Vegas Bay. (Poertner)
W75-04867

A LINEAR-PROGRAMMING SOLUTION TO SALMON MANAGEMENT,
Washington Univ., Seattle. Center for Quantitative Science; and Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 8I.
W75-05021

OPTIMAL EXPANSION OF A WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
Academic Press, Inc., New York and London, 1974. p 273, 46 fig, 22 tab, 73 equ, 100 ref, 3 append. OWRT A-022-TEX(1).

Descriptors: Water resources, *Alternative planning, *Optimization, Methodology, *Model studies, *Multiple-purpose projects, *River basin development, *Economics, Water quantity, Capital, Investment, Budgeting, Scheduling, Dams, Simulation analysis, Water quality, Constraints, Reservoirs, Operating costs, Stochastic processes, Algorithms, Systems analysis.
Identifiers: Project expansion, Benefit maximization, Cost minimization, Sensitivity analysis, Branch and bound method, Out-of-kilter algorithm, Objective function.

A computationally and politically practical methodology for water resources planning is described. Its aim is the optimal expansion, over a fixed planning horizon, of a realistic water resources system that will meet increased demand, while maintaining water quality standards. After setting forth the criteria and scope of the problem, a physical-economic-water quantity river basin model is developed and an optimization strategy is formulated to maximize, over the set of alternative projects, the system benefits. The mixed integer programming optimization problem is decomposed into a capital budgeting problem and an operating policy problem. The optimization algorithm is applied to a project expansion, capital investment problem in a model river basin resembling the Maule River Basin in central Chile; return from the first feasible solution is within 3.3% of the final optimum. Next, a sensitivity analysis is made to discover the critical parameters and inputs in the model. Finally, the incorporation of water quality management into the water quantity model is described; use is made of the Streeter-Phelps equation and the objective function becomes one of cost minimization. A FORTRAN listing of the computer program to execute the optimization algorithm appears in Appendix A; a detailed solution of the example problem is provided in Appendix B. (See W75-05316 thru W75-05321) (Bell-Cornell)
W75-05315

INTRODUCTION,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
In: Optimal Expansion of A Water Resources System, p 1-37, (Chapter1), Academic Press, New York and London, 1974. 13 fig, 4 tab, 10 equ.

Descriptors: *Water resources development, *Comprehensive planning, *Optimization, *Multiple-purpose projects, Linear programming, Dynamic programming, River basins, Evaluation, Capital, Investment, Reservoir operation, Equations, Systems analysis.
Identifiers: Capacity expansion.

The development of water resources has progressed from single-purpose projects to multipurpose programs encompassing entire river basins. Presented is a discussion of the problems in planning for a comprehensive water resources system, how these problems are attacked, and what criteria are used to evaluate the expansion of an already existing system. The use of systems analysis, specifically optimization techniques, in solving water resource problems is considered in depth. The two principal methods of optimization are classified as: analytical methods, which make use of the classical techniques of differential calculus and the calculus of variations; and numerical methods, which generate solutions by means of iterative procedures. Three important numerical optimization tools--linear, nonlinear, and dynamic programming---are summarized in order to exemplify the significant role played by the model and objective function in the optimization of a water resources system. Considered specifically are the sequencing of capital investment in water resource projects and the choice of reservoir operating rules. Included is a discussion of quantitative, economic criteria for optimal water resource planning and a short review of previous work done in the area. (See also W75-05315) (Bell-Cornell)
W75-05316

FORMULATING THE PROBLEM OF THE OPTIMAL EXPANSION OF AN EXISTING WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
In: Optimal Expansion of A Water Resources System, p 38-65 (Chapter 2), Academic Press, New York and London, 1974. 7 fig, 2 tab, 18 equ.

Descriptors: Water resources, *Multiple-purpose projects, *River basin development, Economics, *Reservoir operation, *Optimum development plans, Mathematical models, Constraints, Costs, Benefits, Capital, Investment, Timing, Dams, Decision making, Reservoir storage, Recreation demand, Equations, Systems analysis.
Identifiers: *Project expansion, Objective function, Physical constraints, Benefit maximization, Revenue.

The problem of expanding an existing water resources system is formulated in mathematical terms by providing functions, equations and inequalities that represent appropriate criteria and the characteristics of the physical system. The locations of possible dam sites are assumed to be determined by the topography and runoff of a particular region. Dealt with is the question of when new elements should be added to an existing system and how large the new elements should be. Considered first are major assumptions and decisions that must be made in formulating the problem statement. Next, establishment of an objective function representing the criteria for a river basin and the formulation of a model of the basin, including identification of the different elements and the costs and benefits, are examined. An appropriate time scale (the Month) is selected for the water flows, and a time scale of a year is selected for the introduction of new projects. All variable and parameters are restricted to being deterministic in order to simplify the model and make it possible to apply the optimization techniques described in the following chapter. (See also W75-05315) (Bell-Cornell)
W75-05317

A PROCEDURE FOR SOLVING THE OPTIMAL EXPANSION PROBLEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
In:Optimal Expansion of a Water Resources System, p 66-105 (Chapter 3), Academic Press, New York and London, 1974. 15 fig, 7 tab, 21 equ.

Descriptors: Water resources, *River basin development, *Planning, *Optimization, *Algorithms, Capital, Budgeting, Methodology, Reservoir operation, Dams, Feasibility, Networks, Constraints, Water demand, Equations, Mathematical models, Systems analysis.
Identifiers: *Cost minimization, Project expansion, Branch and bound method, Out-of-kilter algorithm, Allocation, Water flow.

The problem of expanding an existing water resources system has been mathematically formulated in a way designed to facilitate solution and a corresponding river basin model incorporating physical and economic elements was developed. Methodology is described for solving the problem. Developed is an optimization strategy to maximize, over the set of alternative projects, the sum of the discounted present value of net earnings of the system, subject to the water demands and various institutional, physical, and budgetary limitations. The optimization problem is posed as a 0-1 mixed integer programming problem that is decomposed into the set of all feasible combinations--a capital budgeting (CB) problem --, and the economic return is determined for each combination--an operating policy(OP) problem. The CB problem is solved using Little's branch and bound algorithm; the OP problem is solved by Fulkerson's out-of-kilter algorithm which takes advantage of the problem network structure. These two problems are interconnected because the operating return in the CB problem is determined only by obtaining the optimal solution of the OP problem, and the total number of dams in the OP problem is the optimal solution of the CB problem. (See also W75-05315) (Bell-Cornell)
W75-05318

APPLICATION OF THE OPTIMIZATION ALGORITHM TO A WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
In: Optimal Expansion of a Water Resources System, p 106-129 (Chapter 4), Academic Press, New York and London, 1974. 4 fig, 6 tab.

Descriptors: Water resources, *River basin development, Economics, *Optimization, *Algorithms, *Reservoir operation, Dams, Capital, Investment, Planning, Constraints, Methodology, Networks, Water circulation, Mathematical models, Computers, Systems analysis.
Identifiers: Project expansion, *Benefit maximization, Decision tree, Branch and bound method, Out-of-kilter algorithm, Decomposition method, Water flow.

A methodology for expansion of an existing water resources system has been developed, including a physical-economic river basin model and a decomposition algorithm for maximizing system benefits, subject to water demands and various institutional, physical, and budgetary constraints. The optimization algorithm decomposes the original mixed integer programming problem to the set of all feasible combinations (capital budgeting problem) using Little's branch and bound algorithm, and the economic return is determined for each combination (an operating policy problem) utilizaing Fulkerson's out-of-kilter algorithm. The efficacy of the optimization algorithm is demonstrated by applying it to a project expansion, capital investment problem in a model river basin that resembles the Maule River Basin in central Chile. Objectives of proposed expansion are limited to two disparate facets of a water resources system: (1) withdrawal consumptive use (irrigation) and (2) withdrawal nonconsumptive use (generation of hydroelectric energy). Municipal, industrial, and recreational water uses are incorporated implicity in the river basin model by specifying respectively minimum flows in the relevant river reaches and seasonal water levels in the reservoirs. The model incorporates realistic economic and hydrological parameters. The efficacy of the solution procedure is demonstrated in the fact that the return from the first feasible solution is within 3.3% of the final optimum. (See also W75-05315) (Bell-Cornell)
W75-05319

THE SENSITIVITY OF PLANNING DECISIONS IN RIVER BASIN MANAGEMENT,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
In:Optimal Expansion of A Water Resources System, p 130-142 (Chapter 5), Academic Press, New York and London, 1974. 3 fig, 3 tab, 5 equ.

Descriptors: *River basins, *Planning, *Management, *Dams, *Scheduling, *Stochastic processes, Decision making, Interest rates, Construction, Projects, Reservoirs, Costs, Irrigation, Demand, Hydrology, Optimization, Simulation analysis, Regression analysis, Algorithms, Mathematical models, Systems analysis, Equations, Risks.
Identifiers: *Sensitivity analysis.

Water resources management occurs in a dynamic environment in which changes in inputs, costs, and objectives occur because of related technological, political, and social changes. A deterministic, physical-economic river basin model which employs a decomposition algorithm for maximizing benefits is examined using sensitivity analysis. Measured is the sensitivity of the model's objective function and outputs to small variations in four inputs and parameters: (1) system hydrology; (2) reservoir costs; (3) future irrigation demand; and (4) interest rate. A linear penalty function is used to punish noncompliance with irrigation demands. Single- and multiparameter sensitivity functions are defined, and the relationship between outputs and inputs of the water resources model is explained. Results show the dam construction schedule to be insensitive in 11 out of 16 trials. When both interest rate and reservoir costs were raised simultaneously, no solution was possible for scheduling the dam construction. Finally, three simulation strategies are considered in a discussion of stochastic analysis of water resources systems. Method 3, which combines optimization and regression analysis with simulation, is concluded to be the most reliable. (See also W75-05315) (Bell-Cornell)
W75-05320

HOW TO INCORPORATE WATER QUALITY AND POLLUTION CONSIDERATIONS INTO THE MODEL OF THE WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
D. T. O'Laoghaire, and D. M. Himmelblau.
In: Optimal Expansion of A Water Resources System, p 143-157 (Chapter 6), Academic Press, New York and London, 1974. 4 fig, 19 equ.

Descriptors: *Water quality, *Planning, *Management, *River basin development, *Waste water treatment, *Optimization, Simulation analysis, Constraints, Pollution abatement, Reach(Streams), Projects, Scheduling, Dissolved oxygen, Low-flow augmentation, Operating costs, Equations, Systems analysis, Mathematical models, Waste treatment.
Identifiers: Project expansion, *Cost minimization, Biological oxygen demand, Streeter-Phelps equation.

The interactive nature of a water resources system and the fact that water in typical rivers is used and reused numerous times in its transit downstream require a detailed examination of water quality in conjunction with water quantity. This chapter describes the incorporation of water quality management into a previously developed scheme for the optimal expansion of an existing water resources system, which includes a physical-economic river basin water quantity model and a decomposition algorithm for maximizing system benefits. It is assumed that quality problems arise in free-flowing fresh water river reaches, and a modern modification of the Streeter-Phelps equation is used to calculate the profiles of biological oxygen demand and dissolved oxygen in each reach of the system. Two strategies for controlling water quality are considered: low flow augmentation and direct waste treatment at the polluting source. The previously formulated optimization problem becomes: For a planning horizon and a set of alternative waste water treatment projects, select a period for introducing each project so as to minimize the system costs while meeting all the constraints (budgetary, technological, physical, and water quality standards). The comprehensive water management problem is decomposed, for solution, into two interdependent subproblems: the water quantity problem and the water quality problem. (See also W75-05315) (Bell-Cornell)
W75-05321

WATER SUPPLY, TREATMENT, DISTRIBUTION, AND REUSE OPTIMIZATION IN ARID URBAN AREAS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-05322

6B. Evaluation Process

ESTABLISHMENT OF OPERATIONAL GUIDELINES FOR TEXAS COASTAL ZONE MANAGEMENT: INTERIM REPORT ON RESOURCE CAPABILITY,
Texas Univ. at Austin.
For primary bibliographic entry see Field 2L.
W75-04851

A PRACTICAL APPROACH TO WATER QUALITY MANAGEMENT PLANNING,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W75-04857

CITY OF SPARKS, NEVADA, FEASIBILITY STUDY FOR SPANISH SPRINGS INTERCEPTOR,
Spink Corp., Reno, Nev.
For primary bibliographic entry see Field 5D.
W75-04863

ADDENDUM TO THE ENVIRONMENTAL ASSESSMENT, ANNEX B, LAS VEGAS WASH/BAY POLLUTION ABATEMENT PROJECT,
VTN Nevada, Las Vegas.
For primary bibliographic entry see Field 5E.
W75-04869

WATER QUALITY RELATIONSHIPS IN THE GREAT LAKES: ANALYSIS OF A SURVEY QUESTIONNAIRE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W75-04894

RECREATIONAL USES OF GREEN BAY: BAY/NON-BAY USERS COMPARED,
Wisconsin Univ., Green Bay. Leisure Sciences Collateral.
R. B. Ditton, and T. L. Goodale.
In: Proceedings 15th Conference on Great Lakes Research, April 5-7, 1972, Wisconsin Univ., Madison, International Association Great Lakes Research, p 729-736. 1 fig, 4 tab, 9 ref.

Descriptors: *Recreation, *Water quality, *Wisconsin, Attitudes, Fishing, Boating, Swimming, Water utilization, Social aspects, Economics, Lake Michigan, Surveys.
Identifiers: *Green Bay(Lake Michigan), Brown County(Wis), Door County(Wis), Kewaunee County(Wis), Marinette County(Wis), Oconto County(Wis).

Managing the water quality of Green Bay and tributary water requires knowledge of the extent of recreational usage if interaction conflicts between water uses are to be minimized, if not eliminated. Following the development of a reliable interview schedule, a survey of permanent and seasonal resident heads of households was conducted throughout the five-county study area adjacent to the bay, i.e., Brown, Door, Kequanee, Marinette, and Oconto. The proportion of a representative sample of heads of households in the counties who use Green Bay for recreation are identified. While seven of ten household heads interviewed participated in fishing, boating, or swimming, only three of ten had used Green Bay during the preceding twelve months, indicating that the bay was not a focal point of waterbased recreation among residents of the study area. The data suggest that the use and location of use of Green Bay waters for fishing, boating, and swimming is related to participants' perception of the bay's water quality and characteristics. Bay users were more troubled by winds, water temperature, and cloudiness, were more deterred from further participation by 'dirty water,' and were inclined to allocate more money for water quality improvement. (Jones-Wisconsin)
W75-04913

ROOKERY BAY LAND USE STUDIES, THE RESOURCE BUFFER PLAN: A CONCEPTUAL LAND USE STUDY,
Miami Univ., Fla. Center for Urban Studies.
For primary bibliographic entry see Field 4A.
W75-04929

MULTIPLE USES OF UTAH IRRIGATION CANALS: CACHE COUNTRY AS A CASE STUDY,
Utah Cooperative Forest Recreation Research Unit, Logan.
For primary bibliographic entry see Field 4A.
W75-04939

ESTIMATING WATER QUALITY BENEFITS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-05068

CARRYING CAPACITY IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Utah State Univ., Logan.
A. B. Bishop, H. H. Fullerton, A. B. Crawford, M. D. Chambers, and M. McKee.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, price $2.55. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-74-021, February 1974. 170 p, 22 fig, 7 tab, 134 ref. ROAP/TASK 21 AKL-22. EPA 802444.

Descriptors: *Carrying capacity, *Regional analysis, Input-output analysis, Simulation analysis, *Management, *Model studies, Environmental effects, Planning.
Identifiers: Externality models.

The concept of carrying capacity is examined in the context of regional environmental management. Historically, the notion of carrying capacity developed out of descriptions of the growth and dynamics of natural populations, and as such has been used as basis for range and forest management practices. Applied to human activities, however, the concept must be broadened to include the complex relations among resources infrastructure and productive activities, residuals, and societal preferences for quality of life within both the natural and human environments. Four dimensions of a human oriented carrying capacity--resource/production, environment/residuals, infrastructure/congestion, and production/societal relations--are described within normative and operational definitions of carrying capacity. Carrying capacity is then viewed from the standpoint of resources, regional structure, and regional models to see how it fits within the theoretical and analytical considerations related to these areas. A carrying capacity-based planning process is described where the forces for change in the region are analyzed in terms of impacts on identified carrying capacity indices and compared with desired levels to pinpoint areas in which capacities have been exceeded. Considerations in applying carrying capacity concepts in local/urban planning are discussed. (EPA)
W75-05069

EVALUATION OF ADJUSTMENT ASSISTANCE PROGRAMS WITH APPLICATION FOR POLLUTION CONTROL,
Bowdoin Coll., Brunswick, Maine.
For primary bibliographic entry see Field 5G.
W75-05074

BIBLIOGRAPHY OF WATER POLLUTION CONTROL BENEFITS AND COSTS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-05077

WEATHER MODIFICATION-RELATE UNCERTAINTIES IN ECOLOGICAL AND AGRICULTURAL SYSTEMS IN THE HIGH PLAINS: SCIENTIFIC APPRAISAL AND RECOMMENDED RESEARCH,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 3B.
W75-05118

MASS MEDIA HANDBOOK FOR WATER RESOURCES RESEARCH DIRECTORS,
Missouri Univ., Columbia. Coll. of Agriculture.
R. R. Kahle, and R. L. Lee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 950, $3.25 in paper copy, $2.25 in microfiche. Completion Report SR166, December 1974, 14 p. OWRT X-127-MO(No. 3756)(3).

Descriptors: *Attitudes, *Information exchange, Social participation, *Water resources, *Communication, Surveys, Research, Planning, Decision-making, Evaluation, Photography, Methodology.
Identifiers: *Public relations, *Mass media, Information dissemination, Newspapers, Radio, Television.

Completion report results are expressed in pragmatic terms, information functions of Water Resource Research Centers and organizations are defined and tips to put them into practice are offered. The recommended approach is half informational/half public relations. Initially, the target public must be identified. A four step public relations process follows. Steps include (1) research - surveys, interviews, content analysis, questionnaires, semantic differential, Q-Methodology, etc.; (2) planning and decision-making; (3) communication; (4) evaluation and acceptance of the program. Characteristics of various media, including newspapers, radio, television, public speaking, and photography, are presented along with hints for their use. (See also W74-12192)
W75-05261

PROBLEMS AND OPPORTUNITIES IN INTERDISCIPLINARY RESEARCH: THE MOLYBDENUM PROJECT,
Colorado Univ., Boulder. Dept. of Physics and Astrophysics.
For primary bibliographic entry see Field 5G.
W75-05298

NATIONAL NEED - AN INDUSTRY VIEW OF RESEARCH,
AMAX Lead and Zinc, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 5G.
W75-05299

INFORMATION SYSTEMS IN ENVIRONMENTAL RESEARCH AND DECISION-MAKING,
Oak Ridge National Lab., Tenn.
G. U. Ulrikson, and E. D. Copenhaver.
In: Proceedings of the First Annual NSF Trace Contaminants Conference August 8-10, 1973, Oak Ridge, Tenn., Publ. by U.S. Atomic Energy Com-

mission, Office of Information Services, Technical Information Center, Oak Ridge, Tenn., March, 1974, p 732-745, 2 tab, 5 fig, 23 ref.

Descriptors: *Information retrieval, *Documentation, *Information exchange, *Decision making, Management, Data collections, Publications, Bibliographies, Environment.

The strategy and methodology of an information system in meeting user needs were discussed in terms of five major general types of environmental information needs. The first need cited was for bibliographic information. It was suggested that repackaging of information from large computer readable data bases produced by bibliographic services is extremely cost effective and expedient. The second information need was that of directories and inventories of current researchers and research projects. It was noted that both scientists and information processors are giving thought to the third need - factual information files - by considering development of a method for extracting and summarizing pertinent data from technical papers and reports without destroying the integrity of the data reported. The fourth need was for detailed unanalyzed numerical data that could be merged with other information for final assessment. Finally, it was noted that information systems can play a significant role in the evaluation of data and the subsequent preparation of reviews and state-of-the-art document. (See also W75-05277) (Pulliam-Vanderbilt)
W75-05301

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W75-05306

THE ECONOMIC AND ENVIRONMENTAL BENEFITS FROM IMPROVING ELECTRICAL RATE STRUCTURES,
Faucett (Jack) Associates, Inc., Chevy Chase, Md.
D. M. Sharefkin.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.55. Environmental Protection Agency, Socioeconomic Studies Series Report EPA-600/5-74-033, November 1974. 157 p, 3 fig, 46 tab, 8 ref. Program Element 1HA093 21AQL-03 EPA Contract 69-01-1850.

Descriptors: Electric Power, *Electric power rates, Economics, *Benefits, Evaluation, Environment, *Pricing.
Identifiers: *Cost savings, Load curve studies.

Quantitative estimates of the internal cost savings to be derived from changes in the pricing of electric power are devised and evaluated. The econometric literature on electricity demand is surveyed, and elasticity values are selected which are parameters for the overall benefit measures. A method for using reported utility data to estimate the cost of delivered power--at the system peak and off the system, and for each customer class--is devised. Data on five electric utilities used to make estimates of the potential benefits from improvements in the pricing of electric power, for each customer class in each system. The estimated potential benefits are sufficiently large to merit load curve studies by block for residential customers. Such studies are necessary preliminaries to a definitive assessment of the proposals for so called inversion. (EPA)
W75-05309

OPTIMAL EXPANSION OF A WATER RESOURCES SYSTEM,
Universidad Simon Bolivar, Caracas (Venezuela). Departamento de Matematicas y Ciencia de la Computacion.
For primary bibliographic entry see Field 6A.
W75-05315

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC AND FINANCIAL ASPECTS OF WASTEWATER TREATMENT IN THE ST. FRANCOIS RIVER BASIN, QUEBEC - A PRELIMINARY ANALYSIS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5D.
W75-04872

EXPECTATIONS FOR THE CLOSED WATER SYSTEM AND COST COMPARISON WITH EFFLUENT PURIFICATION (DIE ERWARTUNGEN AND DEN GESCHLOSSENEN WASSERKREISLAUF IM KOSTENVERGLEICH ZUR ABWASSERREINIGUNG),
Krofta Apparatebau (Gesellschaft) (West Germany).
For primary bibliographic entry see Field 5D.
W75-04944

ANALYSIS OF COST SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
For primary bibliographic entry see Field 5G.
W75-05076

THE ECONOMIC AND ENVIRONMENTAL BENEFITS FROM IMPROVING ELECTRICAL RATE STRUCTURES,
Faucett (Jack) Associates, Inc., Chevy Chase, Md.
For primary bibliographic entry see Field 6B.
W75-05309

DOLLAR GAIN TO TOP COST CLIMB IN 1975 SEWERAGE CONSTRUCTION.
For primary bibliographic entry see Field 5D.
W75-05325

6D. Water Demand

HYDROLOGIC ASPECTS OF A LOW FLOW WATER MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 4A.
W75-04862

AN AGRICULTURAL IRRIGATION MODEL FOR A WATERSHED,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-05307

6E. Water Law and Institutions

HYDROLOGIC ASPECTS OF A LOW FLOW WATER MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 4A.
W75-04862

IMPACT OF DETERGENT PHOSPHATE REDUCTIONS ON WATER QUALITY,
State University Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W75-04895

ENVIRONMENTAL PROTECTION IN THE FINNISH PULP AND PAPER INDUSTRY (UMWELTSCHUTZ IN DER FINNISCHEN ZELLSTOFF- UND PAPIERINDUSTRIE),
Finnish Pulp and Paper Research Inst., Helsinki.
For primary bibliographic entry see Field 5G.
W75-04949

NEW DEVELOPMENTS IN EFFLUENT LEGISLATION, ESPECIALLY LAWS GOVERNING EFFLUENT DISPOSAL (NEUERUNGEN AUF DEM ABWASSERRECHTS-SEKTOR -- INSBESONDERE ABWASSERABGABENGESETZ),
Industrie-Wasser-Umweltschutz e.V., Dueren (West Germany).
For primary bibliographic entry see Field 5G.
W75-04950

THE FEDERAL WATER POLLUTION CONTROL ACT AND FORESTRY,
National Forest Products Association, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-04957

A LOOK AT THE NATIONAL PERMIT PROGRAM,
For primary bibliographic entry see Field 5G.
W75-04995

COMMENTS ON US EPA PROPOSED CRITERIA FOR WATER QUALITY,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5G.
W75-05052

ANALYSIS OF COST SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
For primary bibliographic entry see Field 5G.
W75-05076

A REVIEW OF THE LITERATURE CONCERNING THE STEEL INDUSTRY AND POLLUTION. PART 1. THE BACKGROUND TO POLLUTION,
British Steel Corp., Sheffield (England). Information Services.
For primary bibliographic entry see Field 5G.
W75-05093

AN APPROACH TO THE CONTROL OF TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W75-05300

CALIFORNIA ENVIRONMENTAL QUALITY ACT: INNOVATION IN STATE AND LOCAL DECISIONMAKING,
Center for California Public Affairs, Claremont.
For primary bibliographic entry see Field 6G.
W75-05314

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: KANSAS AND WAKARUSA RIVERS, LAWRENCE, KANSAS,
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-04852

FLOOD PLAIN INFORMATION -- GREENS AND HALLS BAYOUS, HARRIS COUNTY, TEXAS,
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 4A.
W75-04853

FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, NEW CASTLE COUNTY, DELAWARE,
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-04855

CROP INSURANCE AND INFORMATION SERVICES TO CONTROL USE OF PESTICIDES,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W75-05070

6G. Ecologic Impact Of Water Development

ESTABLISHMENT OF OPERATIONAL GUIDELINES FOR TEXAS COASTAL ZONE MANAGEMENT: INTERIM REPORT ON RESOURCE CAPABILITY,
Texas Univ. at Austin.
For primary bibliographic entry see Field 2L.
W75-04851

PLAN OF STUDY, YAKIMA RIVER BASIN, TASK III REPORT FOR THE YAKIMA BASIN WATER QUALITY MANAGEMENT PLAN,
CH2M/Hill, Bellevue, Wash.
Washington Department of Ecology, Olympia, October 1973. (Revised March 1974). 49 p, 1 fig, 4 tab.

Descriptors: *Water pollution control, *Watershed management, *Water quality control, *Planning, *Washington, Water Quality Act, Water pollution, Long-term planning, Ecology, Organic wastes, Municipal wastes, Farm wastes, Irrigation.
Identifiers: *Yakima River Basin.

The goal of the Water Quality Management Plan for the Yakima Basin is to maintain and enhance water quality of the lakes and streams in the basin while supplying an adequate supply of high-quality water domestic, municipal, industrial, recreation and irrigation purposes and to preserve, protect, and enhance the fish and wildlife resources. Various water uses in the Yakima River Basin include: irrigation, Salmonids propagation, boating and fishing, wildlife, municipal and industrial, aesthetic enjoyment, water contact recreation, warm water fishing and power. The tasks included in the study plan involve: evaluation of the present water quality; development of basin physical, social and economic characteristics; municipal, industrial and domestic wastewater; irrigated agriculture; confined animals; fisheries and wildlife; recreation; forestry; urban runoff; mining, gas and oil wells, nuclear wastes, solid wastes and construction; effects of alternative management practices; monitoring surveillance, and preparation of the basin water quality management plan. (Poertner)
W75-04865

FRAMEWORK FOR THE PLAN OF STUDY, YAKIMA RIVER BASIN, TASK I REPORT FOR THE YAKIMA BASIN WATER QUALITY MANAGEMENT PLAN,
CH2M/Hill, Bellevue, Wash.
Washington Department of Ecology, Olympia, July 1973. 84 p, 2 fig, 1 tab, 190 ref.

Descriptors: *Planning, *Water quality control, *Watershed management, *Washington, *Water pollution control, Irrigation, Farm wastes, Municipal wastes, Organic wastes, Water Quality Act, Legislation, Water pollution, Long-term planning, Ecology.
Identifiers: *Yakima River Basin.

A water quality management plan is being prepared for the Yakima River Basin to satisfy state and federal laws. The plan will be designed to control and abate water pollution and protect water quality for 30 years. The plan requires the completion of four tasks: Task 1, Framework for the Study; Task 2, Regionalization Study; Task 3, Plan of Study; and Task 4, the development of the Water Quality Management Plan. It appears that the following are the most serious water quality problems in the Yakima basin: high bacterial counts due to inadequately disinfected municipal wastes and runoff from improperly designed feedlots; high water temperatures due to agricultural return flows and natural causes; localized dissolved oxygen sags due to discharge of organic materials from wastes and return flows; low flows during certain times of the year below the major regulatory and diversion dams; turbidity caused by spring snowmelt runoff and irrigation practices; and aesthetically unpleasing conditions in the lower river due to low flows, high algal growth, and turbidity. (Poertner)
W75-04866

ENVIRONMENT U.S.A.: A GUIDE TO AGENCIES, PEOPLE, AND RESOURCES.

Descriptors: *Environment, *Human resources, *Organizations, Governments, Federal government, Local governments, Libraries, Education, Films, Conferences, Technical societies, Trade associations, Employment opportunities, Legislation, Labor unions, Bibliographies, Publications, Financing, Professional societies, Personnel, Labor, Management.
Identifiers: *Directories, Newspapers, Radio stations, Television stations, Consultants, Information sources.

This compilation lists environmental federal and state government agencies, private (citizens', trade, professional, and defunct) organizations, environmental consultants (classified by state), environmental officers of U.S. corporations (according to industry), environmental education programs, films, libraries, conferences, and information-disseminating newspapers, radio and television stations (classified by regions). Chapters are included on environmental employment, fundraising, law, and environmental concerns of labor unions. A subject-classified bibliography, a glossary of terms, an alphabetical index, and a classified index to federal agencies are appended. (Brown-IPC)
W75-04946

WORLD DIRECTORY OF ENVIRONMENTAL RESEARCH CENTERS.
For primary bibliographic entry see Field 10D.
W75-04971

AN ATTEMPT AT EVALUATING THE STABILITY OF AN AQUATIC ECOSYSTEM,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W75-05009

CARRYING CAPACITY IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W75-05069

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates, Engineers, San Francisco, Calif.
For primary bibliographic entry see Field 8D.
W75-05117

WEATHER MODIFICATION-RELATE UNCERTAINTIES IN ECOLOGICAL AND AGRICULTURAL SYSTEMS IN THE HIGH PLAINS: SCIENTIFIC APPRAISAL AND RECOMMENDED RESEARCH,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 3B.
W75-05118

THE USE OF COLOR INFRARED AERIAL PHOTOGRAPHY IN DETERMINING SALT MARSH VEGETATION AND DELIMITING MAN-MADE STRUCTURES OF LYNNHAVEN BAY, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W75-05126

EFFECTS OF ECONOMIC DEVELOPMENT UPON WATER RESOURCES (AN INTERINDUSTRY APPROACH TO MODELING ECONOMIC-ENVIRONMENTAL SYSTEMS),
Maryland Univ., College Park. Bureau of Business and Economic Research.
J. H. Cumberland, and B. N. Stram.
Available from the National Technical Information Service, Springfield Va. 22161 as PB-239 875, $5.25 in paper copy, $2.25 in microfiche.--Technical Report No 18, (1974). 105 p, 2 fig, 6 ref, 4 append. OWRT B-007-MD(1). 14-31-0001-3089.

Descriptors: *Model studies, Economics, *Pollutants, *Industrial wastes, Industries, *Environmental effects, *Management, Water resources development, *Economic impact, *Economic prediction.

A theoretical model is presented of interrelationships between economic and environmental models, together with basic data on 130 types of pollutants from 70 different industries. The purpose has been to provide data and analytic methods needed for improved environmental management. The first step was to devise a materials balance accounting structure in order to provide a coherent and complete format for emissions. This accounting structure was incorporated in a set of worksheets and instructions and distributed to relevant government agencies. The data collects with substantial internally developed data, have been used to create a simple, two-stage model of the emissions process. High priority in environmental research should now be assigned to the evaluation of damage functions associated with various levels of the emissions reported, and on the incremental costs of controlling these emissions. Integration of this additional kind of information with the data is necessary in order to provide the basis for improved environmental management.
W75-05174

INVESTIGATION OF ENRICHMENT OF MOLYBDENUM IN THE ENVIRONMENT THROUGH COMPARATIVE STUDY OF STREAM DRAINAGES, CENTRAL COLORADO,
Colorado Univ., Boulder. Dept. of Geological Science.
For primary bibliographic entry see Field 5B.
W75-05293

CONTROL OF ENVIRONMENTAL IMPACTS FROM ADVANCED ENERGY SOURCES,
Stanford Research Inst., Menlo Park, Calif.
E. E. Hughes, E. M. Dickson, and R. A. Schmidt.
Environmental Protection Agency, Technology Series, Report EPA-600/2-74-002, p 326, March 1974. 3 fig, 23 tab, 17 ref, 6 append. Program Element 1AB013, EPA Contract 68-01-0483.

Descriptors: *Environmental control, Energy technology, *Air pollution, *Geothermal energy, Oil shales, Solid wastes, Hydrogen.
Identifiers: *Coal gasification, *Environmental impact, *Solar energy, *Hydrogen energy sources, *Energy sources.

The technology and environmental effects associated with production of energy from new or advanced sources are reviewed. These include solar, geothermal, oil shale, solid wastes, underground coal gasification, and hydrogen energy sources. Projections to the year 2000 of levels of energy production from the first four of these sources are presented. Environmental impacts on air and water quality, and land use are derived per unit of energy. Levels of pollutant emissions and other environmental effects of the development of these advanced energy sources are projected. Impacts likely to require control measures are identified. Subjects for research and development directed toward control of environmental impacts are recommended. These recommendations are incorporated into a research and development plan. Approximate priority assignments derived from consideration of the timing of development and the importance and degree of definition of the identified environmental effects are given. (EPA)
W75-05313

CALIFORNIA ENVIRONMENTAL QUALITY ACT: INNOVATION IN STATE AND LOCAL DECISIONMAKING,
Center for California Public Affairs, Claremont.
T. C. Trzyna, and A. W. Jokela.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, price $2.00. Environmental Protection Agency Socioeconomic Studies Series EPA-600/5-74-023, October 1974. p 125, 18 ref, 2 append. EPA Program Element 1HA095, Contract 68-01-1818.

Descriptors: California, *Legislation, Legal aspects, *Decision making, *Administrative agencies, Organization, State government, Local governments, Environment.
Identifiers: *California environmental quality act, *Environmental impact.

The California Environmental Quality Act of 1970 requires State and local agencies to prepare an environmental impact report on public and private projects that may have a significant effect on the environment. The development and current status of California's environmental impact assessment program is described. CEQA's greatest impact has been on private projects permitted by cities and counties. In many localities, environmental impact reports clearly influence decisions on such permits. Still, some State and local agencies are not fully complying with CEQA, and the act's implementation is hampered by the lack of a State agency with authority and resources to enforce it. Based on California's experience, some general recommendations are made for other States considering adopting similar requirements. (See also W74-10527) (EPA)
W75-05314

7. RESOURCES DATA

7A. Network Design

HYDROLOGICAL DATA BANK - PRESENT STATUS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W75-04882

7B. Data Acquisition

INTERLABORATORY QUALITY CONTROL STUDY NO 6: SPECIFIC CONDUCTANCE, PH, COLOUR AND RESIDUE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2K.
W75-04887

A WATER BALANCE RECORDER FOR HYDROCLIMATIC AND AGROCLIMATIC MEASUREMENT OF PRECIPITATION AND EVAPORATION,
For primary bibliographic entry see Field 2D.
W75-04914

REMOTE SENSING POTENTIALS FOR RESOURCE MANAGEMENT,
Purdue Univ., Lafayette, Ind. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 5A.
W75-04922

AN AUTOMATIC UNDERWATER CAMERA SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 5A.
W75-05048

A SUBMERSIBLE AUTOMATIC DISSOLVED OXYGEN-TEMPERATURE MONITORING SYSTEM,
Environmental Protection Agency, Fairview Park, Ohio. Ohio District Basin Office.
For primary bibliographic entry see Field 5A.
W75-05049

METHODS FOR STUDIES OF PLANKTON (IN SWEDISH),
L. Hernroth.
Fauna Flora, Vol 67, No 2, p 86-89, 1972, Illus.
Identifiers: Ecological studies, *Plankton, *Methodology, Network, *Zooplankton, *Sampling.

As a first step, a net of stations covering the research area have to be established. Horizontal tools covering a large area are used for collections of greater quantities of zooplankton. The disadvantage of horizontal sampling is that the method is not good for ecological studies. It is preferable to use vertical tools to take plankton samples because of their simplicity and the better picture they give of the fauna at the locality. Depending on the purpose of the survey, different mesh sizes are used. To decide where in the column of water the different organisms live a 'plankton collector' is used. A sample of plankton has little value if it is not complemented with hydrographic data.—Copyright 1974, Biological Abstracts, Inc.
W75-05061

REMOTE SENSING AS AN AID FOR MARSH MANAGEMENT - LAFOURCHE PARISH, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W75-05095

A PROCEDURE FOR AUTOMATED LAND USE MAPPING USING REMOTELY SENSED MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05096

OPTIMIZING THE MEASUREMENT OF CONVECTIVE RAINFALL IN FLORIDA,
National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.
For primary bibliographic entry see Field 2B.
W75-05097

DEVELOPMENT OF A FIXED SITE SURFACE FILM OIL SAMPLER,
Curtis-Le Vantine and Associates, Tarzana, Calif.
For primary bibliographic entry see Field 5A.
W75-05099

DEVELOPMENT OF A TWO-CHANNEL LINEAR DISCRIMINANT FUNCTION FOR DETECTING AND IDENTIFYING SURFACE WATER USING ERTS-1 DATA.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05103

EVALUATION OF COMPUTER-AIDED PROCEDURE FOR DETECTING SURFACE WATER.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05104

USE OF REMOTE SENSING IN AGRICULTURE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
D. E. Pettry, N. L. Powell, and M. E. Newhouse.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-26876, $6.25 in paper copy, $2.25 in microfiche. Report No NASA CR-62098, January 1974. 139 p, 29 fig, 19 tab, 100 ref, 1 append. NASA Contract No NAS6-1863.

Descriptors: *Remote sensing, *Agriculture, *Aerial photography, On-site data collections, Bays, Measurement, Evaluation, Mapping, Estuaries, Monitoring, Chesapeake Bay, Plant diseases, Soils.
Identifiers: Cylindrocladium black rot disease.

A review of the literature dealing with remote sensing related to agriculture revealed that most of the related literature was no more than five years old. Comparatively little research involving agricultural remote sensing had been conducted in the humid eastern Coastal Plain section of the United States. Factors affecting multispectral photography and thermal infrared recordings related to the energy reflection of plants and soils were studied. Remote sensing techniques were refined for crop, tree species and soil identification. The detection of plant diseases and insect and pollution damage was also studied. From August 1969 through September 1973, 29 remote sensing flights were flown over the Virginia Truck and Ornamentals Research Station at Painter, Virginia.

Ground truth data of the site were collected during each flight. Imagery data collected included black and white infrared, color infrared, and color photographs. Soils on the research station were evaluated and a detailed soil map was prepared. A forest type map was prepared for the wooded area surrounding the research station. An environmental monitoring station was set up to measure soil temperature, air temperature (wet and dry bulb), wind speed and direction, and solar radiation. The information from this monitoring station permited relationship between environmental factors and image quality of remote sensing overflights to be established. (Sims-ISWS)
W75-05107

KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL,
Kansas Univ./Center for Research, Inc., Lawrence.
H. L. Yarger, and J. R. McCauley.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-34743, $4.25 in paper copy, $2.25 in microfiche. Report No 2265-10, March 24, 1974. 49 p, 51 fig, 16 ref. NAS5-21822 Task 5.

Descriptors: *Remote sensing, Surface waters, *Turbidity, Water quality, *Reservoirs, Suspended solids, Dissolved solids, Chlorophyll, Monitoring, Satellites(Artificial), Aerial photography, *Kansas, *Great Plains, *Model studies, *Pollutant identification.
Identifiers: *ERTS-1, Multispectral scanner.

The major reservoirs in Kansas were studied to determine the feasibility of monitoring fresh water resources by satellite. Two reservoirs, Tuttle Creek and Perry, were the object of intensive study to determine the properties of reservoirs which control the spectral intensity of reflected sunlight as detected by the ERTS-1 sensors. Water samples were collected from these two lakes concurrent with satellite overpass and were analyzed to determine the amount of suspended solids, chlorophyll content, and concentrations of phosphate, nitrate, and potassium ions. In addition, water temperature and turbidity at each sample site were measured. ERTS images in four spectral bands (green, red, red-infrared, and infrared) were regularly received for each satellite overpass of Kansas reservoirs. ERTS MSS ratios derived from computer compatible tapes were very effective for quantitative detection of suspended solids up to at least 900 ppm. The relatively high inorganic suspended solids, characteristic of midcontinent reservoirs, dominated the reflected energy present in the four MSS bands. Dissolved solids concentrations up to 500 ppm and algal nutrients up to 20 ppm were not detectable. The MSS5/MSS4 ratio may be weakly correlated with total chlorophyll above approximately 8 micrograms per liter. (Sims-ISWS)
W75-05110

THREE-DIMENSIONAL SUBSURFACE DELINEATION VIA A NOVEL METHOD FOR DETERMINING THE SUBSURFACE ELECTRICAL PROFILE,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 2F.
W75-05116

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM - VOLUME II - DESIGN REPORT.
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W75-05119

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM - VOLUME III - SUBSYSTEM SPECIFICATIONS.
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W75-05120

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME I,
Tennessee Univ., Knoxville.
B. A. Tschantz, J. D. Womak, J. M. Prochaska, H. R. DeSelm, and C. C. Amundsen.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 484, $7.25 in paper copy, $2.25 in microfiche. Report No. AFCRL-TR-73-0118(I), December 1972. 192 p, 62 fig, 10 tab, 128 ref. AFCRL Contract F19628-69-C-0016.

Descriptors: *Remote sensing, *Photography, *Water resources, *Civil engineering, *City planning, Ecology, Agriculture, Agricultural engineering, Agronomy, Forestry, Electrical engineering, Water quality, Thermal pollution, Land use, Land classification, Geomorphology, Plant groupings, Plant diseases, Soil moisture, Analytical techniques, Data processing.
Identifiers: *Thermal imagery, Multiband photography, Spectral signature, Botany, Agricultural biology.

The general purpose of the THEMIS Contract at the University of Tennessee was to use a broad interdisciplinary approach toward the application of remote sensing for studying environmental systems. Emphasis was on the use of photography and thermal imagery as tools for quickly retrieving relevant information from expansive and complex environs with aerial platforms such as aircraft, satellites, and towers. Volume 1 summarized the efforts in the disciplines of water resources, planning, botany and ecology, agriculture, and electrical engineering. Remote sensing application studies include thermal and water quality effects in streams and lakes, urban and regional land-use change detection, prediction of landscape (site and cover) parameters, identification of agricultural plant species, detection of plant disease, identification of agricultural soil series, evaluation of soil moisture conditions, and development of remote sensing data processing techniques. (See also W75-05124 and W75-05125) (Sims-ISWS)
W75-05123

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME II,
Tennessee Univ., Knoxville.
R. W. Peplies, and B. A. Tschantz.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 485, $5.25 in paper copy, $2.25 in microfiche. Report No. AFCRL-TR-73-0118(II), December 1972. 109 p, 29 fig, 7 tab, 31 ref, 1 append. AFCRL Contract F19628-69-C-0016.

Descriptors: *Remote sensing, *Photography, Land use, Economics, Population, Regional analysis, Data collections, Analytical techniques, Information retrieval.
Identifiers: *Geography, Thermal imagery, Multiband photography.

Volume II represents the subcontract efforts of the Geography Department at East Tennessee State University. Research was directed toward specific topics of terrain, economic, cultural, and population characteristics of landscapes which are detectable via remote sensing from low and high flying aircraft and also orbiting spacecraft. Remote sensing from different platform heights provides an advantage for geographic data acquisition purposes in terms of three basic modes: (1) spectral (ultraviolet through microwave bands, density level slicing, and multiband photography); (2) spatial (scale and resolution studies); and (3) temporal (short- and long-term duration studies). An appendix contains a bibliography of publications, papers, technical abstracts, theses, dissertations, and other presentations generated under the THEMIS project. (See also W75-05123 and W75-05125) (Sims-ISWS)
W75-05124

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEMS STUDIES, VOLUME III,
Tennessee Univ., Knoxville. Dept. of Geology.
G. M. Clark.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 486, $4.75 in paper copy, $2.25 in microfiche. Report No. AFCRL-TR-73-0118(III), June 1973. 83 p, 24 fig, 14 tab, 38 ref, 1 append. AFCRL Contract F19628-69-C-0016.

Descriptors: *Remote sensing, *Photography, *Landslides, Water resources, City planning, Ecology, Agronomy, Forestry, Electrical engineering, Water quality, Geomorphology, Plant groupings, Analytical techniques, Data processing, Floods.
Identifiers: *Geography, *Botany, Thermal imagery, Spectral signatures, Multiband photography.

Volume III summarized research results in geography, geology, and botany. Remote sensing applications in the detection of revegetating natural and human-related rapid slope mass movements of the class debris slides/debris flows include debris slide scar, debris flow tract, and debris fan and floodplain modification detection and mapping. Field research to establish ground conditions for remote sensing missions also shed light on movement mechanisms, post storm events, and sediment volumes involved in slide scar movements. An appendix contains a bibliography of publications, papers, technical abstracts, theses, and dissertations generated under the THEMIS project. (See also W75-05123 and W75-05124) (Sims-ISWS)
W75-05125

THE USE OF COLOR INFRARED AERIAL PHOTOGRAPHY IN DETERMINING SALT MARSH VEGETATION AND DELIMITING MAN-MADE STRUCTURES OF LYNNHAVEN BAY, VIRGINIA,
Old Dominion Univ., Norfolk, Va. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W75-05126

TO DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES,
Maine Dept. of Transportation, Augusta. Bureau of Highways.
For primary bibliographic entry see Field 4A.
W75-05130

APPLICATION OF REMOTE SENSING TO HYDROLOGY.
IBM Federal Systems Div., Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W75-05131

RESEARCH IN REMOTE SENSING OF AGRICULTURE, EARTH RESOURCES, AND MAN'S ENVIRONMENT,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
D. A. Landgrebe.
Available from the National Technical Information Service, Springfield, Va. 22161, as NASA CR 138885, $4.25 in paper copy, $2.25 in microfiche. Final Report, June 1974. 66 p, 23 fig, 3 tab, 1 append. NASA Grant NGL 15-005-112.

Descriptors: *Remote sensing, *Agriculture, *Satellites(Artificial), *Environment, Crops, Plant diseases, Geologic mapping, Mapping, Soils,

Forests, Data transmission, Water resources, Analysis, Bibliographies.

Satellite data and other remotely sensed data were applied to various problems in agriculture, earth resources, and environment. Techniques were developed for land use mapping, crop mapping, detection of corn blight, soil mapping, and geologic mapping. Useful applications of remote sensing were developed in the areas of forest and water resources. An appendix contains an annotated bibliography of the 160 reports that were previously provided to NASA. (Sims-ISWS)
W75-05132

UTILIZING ERTS IMAGERY TO DETECT PLANT DISEASES AND NUTRIENT DEFICIENCIES, SOIL TYPES AND SOIL MOISTURE LEVELS,
Tennessee Univ., Knoxville. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 3F.
W75-05133

DEVELOPMENT OF A COMPUTER-AIDED PROCEDURE FOR THE NATIONAL PROGRAM OF INSPECTION OF DAM.,
National Aeronautics and Space Administration, Houston, Tes. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05134

HYDROLOGICAL BASIS FOR FORECASTING AND CALCULATING RUNOFF BY SPACE IMAGES OF THE EARTH'S SURFACE,
Kanner (Leo), Associates, Redwood City, Calif.
For primary bibliographic entry see Field 4A.
W75-05135

SOIL-WATER PRESSURE DURING INTERMITTENT SIMULATED RAIN APPLICATION MEASURED WITH A NEW RAPID-RESPONSE TENSIOMETRIC TECHNIQUE,
Agricultural Research Service, Morris, Minn. North-Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2G.
W75-05181

7C. Evaluation, Processing and Publication

FLOOD PLAIN INFORMATION: KANSAS AND WAKARUSA RIVERS, LAWRENCE, KANSAS,
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-04852

FLOOD PLAIN INFORMATION -- GREENS AND HALLS BAYOUS, HARRIS COUNTY, TEXAS,
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 4A.
W75-04853

FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, NEW CASTLE COUNTY, DELAWARE,
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-04855

FLOOD ESTIMATION FOR URBAN AND RURAL CATCHMENTS,
Snowy Mountains Engineering Corp., Cooma (Australia). Hydrology Branch.
For primary bibliographic entry see Field 4A.
W75-04856

STREAM PROGRAMMER'S MANUAL.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
January 1974, 366 p, 110 fig.

Descriptors: *Computer programs, *Streamflow, *Data storage and retrieval, Analytical techniques, Data processing, Publications.
Identifiers: *Programming manuals, Streamflow computations.

The purpose of the STREAM computer program is to automate the computation of streamflow records by compiling daily discharges and gauge heights from data on cards obtained with the d-mac Pencil Follower, i.e., x-y digitizer. Detailed instructions for digitizing water level recorder charts on a Pencil Follower to obtain punched cards containing x-y co-ordinates can be obtained from the Water Resources Branch manual 'Automated Streamflow Computations' by Mr. K.W. Stewart (January 15, 1974). With these cards and the card decks defining the stage-discharge relationship, gauge and shift corrections and updating corrections, the computer program STREAM can be used to obtain daily mean gauge heights and discharges along with the appropriate symbols. This manual provides a detailed description of the STREAM computer program. (Environment Canada)
W75-04874

HYDROLOGICAL DATA BANK - PRESENT STATUS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Water Resources Branch, Report No 33, 1974, 7 ref, 10 fig, 1 table, 13 p.

Descriptors: *Data storage and retrieval, *Hydrologic data, Basic data collections, Statistical models, Runoff, Drainage.
Identifiers: *Hydrometeorological data, Hydrometric networks, Data banks, Information, Processing.

Recent hydrometric network planning studies by the Department of the Environment have resulted in an initial Hydrometeorologic-Physiographic Data Bank. Conjunctive analysis of these data by means of deterministic and statistical models can permit estimation of data at ungauged areas, thus enhancing the information content of the observed data. (Environment Canada)
W75-04882

RESEARCH PROJECTS IN GLACIOLOGY - 1974,
Department of the Environment, Ottawa, (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 2C.
W75-04884

EXTENSION OF HYDROLOGIC PROCESS MODELING TO TOTAL WATERSHED MODELING,
Agricultural Research Services, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W75-04924

ON THE COLLECTION, THE ANALYSIS AND THE SYNTHESIS OF SPATIAL RAINFALL DATA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-04931

HANDBOOK OF ENVIRONMENTAL CONTROL. (1) AIR POLLUTION. (2) SOLID WASTE. (3) WATER SUPPLY AND TREATMENT. (4) WASTEWATER: TREATMENT AND DISPOSAL,
Minnesota Univ., Minne. Div. of Environmental Health.
For primary bibliographic entry see Field 5D.
W75-04945

SIMULATION OF HYPOTHETICAL OFFSHORE PETROLEUM DEVELOPMENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 3E.
W75-05033

ANALYSIS OF OIL SPILL STATISTICS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5C.
W75-05034

OIL SPILL TRAJECTORY STUDIES FOR ATLANTIC COAST AND GULF OF ALASKA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5B.
W75-05035

IMPLEMENTATION OF A COMPUTER-BASED INFORMATION SYSTEM FOR MASS SPECTRAL IDENTIFICATION,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5A.
W75-05085

A PROCEDURE FOR AUTOMATED LAND USE MAPPING USING REMOTELY SENSED MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
S. L. Whitley.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA TR R-434, $3.25 in paper copy, $2.25 in microfiche. NASA Technical Report No R-434, January 1975. 44 p, 10 fig, 2 tab, 10 ref, 4 append.

Descriptors: *Remote sensing, *Land use, *Data processing, Computers, Satellites(Artificial), Aerial photography, Data collections, Analytical techniques, *Mapping.

A system of processing remotely sensed multispectral scanner data by computer programs to produce color-coded land use maps for large areas was described. The procedure was explained, the software and the hardware were described, and an analogous example of the procedure was presented. Detailed descriptions of the multispectral scanners currently in use were provided together with a summary of the background of current land use mapping techniques. The data analysis system used in the procedure and the pattern recognition software used were functionally described. Current efforts by the NASA Earth Resources Laboratory to evaluate operationally a less complex and less costly system also were discussed. (Sims-ISWS)
W75-05096

DEVELOPMENT OF A TWO-CHANNEL LINEAR DISCRIMINANT FUNCTION FOR DETECTING AND IDENTIFYING SURFACE WATER USING ERTS-1 DATA.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-32793, $3.75 in paper copy, $2.25 in microfiche. Report No JSC-08450, August 1973. 30 p, 7 fig.

Descriptors: *Remote sensing, *Satellites(Artificial), *Surface waters,

*Computer programs, Testing, Data processing, Analytical techniques.
Identifiers: *ERTS-1, Multispectral scanner.

The development of a method for detecting surface water by using ERTS-1 multispectral scanner digital data was described. The several computer programs for the processing multispectral data which were available were described, along with the manner in which these programs were used in this effort. The use of the LARSAA program to test and demonstrate the discriminant function was explained in detail. The discriminant function itself was later implemented in an operational program which performs only those specific operations necessary to test each data point for an indication of surface water in the scene. Several possible sources of difficulty in the use of the function were identified and suggestions were made for avoiding or correcting those difficulties. (Sims-ISWS)
W75-05103

EVALUATION OF COMPUTER-AIDED PROCEDURE FOR DETECTING SURFACE WATER.
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
Available from the National Technical Information Service, Springfield, Va 22161 as N74-32792, $4.25 in paper copy, $2.25 in microfiche. Report No JSC-08453, August 1973. 52 p, 7 fig, 1 tab, 4 ref, 4 append.

Descriptors: *Remote sensing, *Satellites(Artificial), *Surface waters, *Computer programs, Evaluation, Data processing, Performance, Analytical techniques.
Identifiers: *ERTS-1, Multispectral scanner.

Results are described of a detailed evaluation of a computer-aided procedure for processing ERTS-1 data to detect and locate surface water for the National Program for the Inspection of Dams (NPID). The procedure was evaluated by using data from a study area in the vicinity of the Lake Somerville area in Washington County, Texas. The result of the evaluation was that the use of the procedure failed to provide acceptable performance results. The success criteria established was that 90% of all areas of surface water of 10 acres or more had to be correctly identified and located with a frequency of false detection of 10% or less. The result from the procedure evaluation was that 100% of all areas of surface water of 10 acres or more were correctly detected, but the frequency of false detection was approximately 96.8%. Appendixes contain detailed descriptions of the computer programs and procedures, and a Fortran IV program listing. (Sims-ISWS)
W75-05104

DISTRIBUTION OF MEAN MONTHLY PRECIPITATION AND RAINFALL INTENSITIES,
Army Engineer Topographic Lab., Fort Belvoir Va. Geographic Sciences Lab.
For primary bibliographic entry see Field 2B.
W75-05105

USE OF REMOTE SENSING IN AGRICULTURE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 7B.
W75-05107

A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME I: SUMMARY REPORT.
IBM Federal Systems Div., Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W75-05108

A STUDY OF REMOTE SENSING AS APPLIED TO REGIONAL AND SMALL WATERSHEDS. VOLUME II: SUPPORTING TECHNICAL DETAILS.
IBM Federal Systems Div., Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W75-05109

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME I,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W75-05123

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEM STUDIES, VOLUME II,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W75-05124

REMOTE SENSOR UTILIZATION FOR ENVIRONMENTAL SYSTEMS STUDIES, VOLUME III,
Tennessee Univ., Knoxville. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W75-05125

A PILOT PROJECT OF WEATHER MODIFICATION FOR THE SAN JUAN MOUNTAINS OF THE COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W75-05127

GEOECOLOGY INFORMATION SYSTEM, PART I. BIOGEOGRAPHIC MAPPING OF SPECIES RANGES: DOCUMENTATION OF INPUT AND DATA CHECKING PROCEDURE FOR COMPUTER STORAGE AND RETRIEVAL OF INFORMATION,
Oak Ridge National Lab., Tenn.
R. K. Schreiber, R. L. Stephenson, F. G. Goff, D. C. West, and G. Muse.
Available from the National Technical Information Service, Springfield, Va 22161 as EDFB IBP 74-5, $5.45 in paper copy, $2.25 in microfiche. Report No. EDFB-IBP 74-5, December 1974. 44 p, 6 fig, 13 ref, 4 append. AEC Contract W-7405-eng-26.

Descriptors: *Data storage and retrieval, *Computer programs, *Data processing, Data collections, Information retrieval, Mapping, Ecological distribution, Ecology, Geology, Biology.

Rationale was presented for the design and development of a regional scale data bank for biogeographical information. Counties were used as the basic cell for storage and retrieval of data. Application of the described procedure for manual digitization and coding of species range maps was made by using tree species found in Little's Atlas of United States Trees. The computer program for storage and retrieval of this spatial data was documented. An appendix contains a program listing of the PL1 language program. (Sims-ISWS)
W75-05129

APPLICATION OF REMOTE SENSING TO HYDROLOGY.
IBM Federal Systems Div., Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W75-05131

RESEARCH IN REMOTE SENSING OF AGRICULTURE, EARTH RESOURCES, AND MAN'S ENVIRONMENT,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 7B.
W75-05132

DEVELOPMENT OF A COMPUTER-AIDED PROCEDURE FOR THE NATIONAL PROGRAM OF INSPECTION OF DAM.,
National Aeronautics and Space Administration, Houston, Tes. Lyndon B. Johnson Space Center.
Available from the National Technical Information Service, Springfield, Va. 22161, as N74-32794, $3.75 in paper copy, $2.25 in microfiche. Report No JSC-08449, August 1973. 43 p, 8 fig, 8 tab, 1 append.

Descriptors: *Remote sensing, *Surface waters, Satellites(Artificial), *Computer programs, Data processing, Evaluation, On-site investigations, Analytical techniques, *Dams.
Identifiers: *ERTS-1, Multispectral scanner.

An effort was undertaken to determine the utility of ERTS-1 MSS data, together with automatic data processing techniques, to detect and locate surface water pursuant to legislation within the jurisdiction of the U.S. Corps of Engineers, and transfer the related technology to the Texas Water Rights Commission. For this purpose, a test site was selected, ERTS-1 MSS and ancillary data obtained, and existent classification programs applied. A linear discriminant function was developed. The results were evaluated for potential candidates for a transferable procedure. A computer-aided technique with a linear discriminant function was selected and recommended. Evaluation of the selected computer-aided procedure for the test site resulted in the detection of 100% of areas of surface water 10 acres or greater in areal extent and the geographic location of areas classified as water to a positional accuracy of 1000 feet or closer. (Sims-ISWS)
W75-05134

DISCHARGE OF SELECTED RIVERS OF CANADA.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2E.
W75-05136

DISCHARGE OF SELECTED RIVERS OF CANADA, SUPPLEMENT 1.
International Hydrological Decade, Ottawa (Ontario). Canadian National Committee.
For primary bibliographic entry see Field 2E.
W75-05137

A STUDY OF RAINFALLS RECORDED AT THE CHERRAPUNJI OBSERVATORY,
Institute of Tropical Meteorology, Poona (India).
For primary bibliographic entry see Field 2B.
W75-05158

CONTINUOUS HYDROLOGICAL TIME-SERIES DISCRETIZATION,
Technical Univ. of Lisbon (Portugal). Instituto Superior Tecnico.
For primary bibliographic entry see Field 2A.
W75-05165

MICROWAVE MAPS OF THE POLAR ICE OF THE EARTH,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2C.
W75-05170

A MODEL TO STUDY THE EFFECTS OF TIME-VARIABLE POLLUTANT LOADS ON STREAM QUALITY,
Saint Catharines (Ontario).
For primary bibliographic entry see Field 5B.
W75-05187

AGRICULTURAL LAND USE IN THE POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-05260

FLOOD FLOW FREQUENCY TECHNIQUES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 2E.
W75-05262

INVESTIGATION OF ALTERNATIVE PROCEDURES FOR ESTIMATING GROUNDWATER PARAMETERS,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 4B.
W75-05263

GTWS: GEORGIA TECH WATERSHED SIMULATION MODEL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-05271

AN AGRICULTURAL IRRIGATION MODEL FOR A WATERSHED,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-05307

8. ENGINEERING WORKS

8A. Structures

CITY OF TORONTO SEWER SYSTEM,
Toronto Dept. of Public Works (Ontario).
R. M. Bremner.
Progress Report No 1, Supplement A, March 30, 1973. 3 p, 4 fig, 3 tab.

Descriptors: *Hydraulic design, *Dynamic programming, *Sewerage, *Urban drainage, *Storm drains, *Combined sewers, Hydraulic engineering, Computer programs, Design flow, Hydraulic structures, Hydraulic systems, Systems analysis, Storage capacity, Pipelines, Canada, Sewers, Backwater, Cities, Water pollution control, Flood control.
Identifiers: *Toronto, Sewer surcharge, Combined sewer overflows.

Recommendations are made to the Toronto Committee on Public Works for modification of the original plans for a system-wide sewer improvement program in the City. A report (See W73-06460) by the Public Works Commissioner, dated March 18, 1970, included descriptions and scheduling of future work planned and work completed to that date. Since that date, computer programs have been developed for use in making hydrograph analyses of large sewer networks. One of these programs computes in detail the flow conditions in the sewer system at any time following the commencement of rainfalls of differing intensities. The effect of the storage volume capacity and the effect of various surcharges on the system are taken into account in a dynamic fashion in this analysis. Using this computer program, City engineers and engineering consultants in Munich, Germany have made revised hydraulic designs of the North Toronto Sewer System. The modifications of the original designs should result in a savings of $1,320,000 in construction costs. The work involves construction of new road storm sewers and modification of cross-connections of existing combined sewers. Tables and maps identifying the design modifications are included. (Poertner)
W75-04864

THE NEATH VALLEY SEWERAGE SCHEME.
For primary bibliographic entry see Field 5D.
W75-05000

WATER RESOURCES DEVELOPMENT, 1950-1965, AN INTERNATIONAL BIBLIOGRAPHY,
Center of Scientific and Technological Information, Tel Aviv (Israel). Library Services.
For primary bibliographic entry see Field 10B.
W75-05154

CHAO PHYA RIVER TRAINING WORKS,
Royal Irrigation Dept., Bangkok (Thailand).
J. Tejasen, and M. Remillieux.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 241-250. 3 fig.

Descriptors: *Navigable waters, *River training, *Channel improvement, *Dredging, *Model studies, Dams, Shoals, Locks, Channel erosion, Rivers, Streamflow, Dry seasons, Bed load, Groins(Structures), Canals, Bank protection, Regulated flow, Discharge(Water).
Identifiers: *Bottom paneling, Rock blasting, *Thailand(Chao Phya River).

Improvement of navigation on the Chao Phya River, Thailand, is presently obtained by rock blasting, mechanical dredging, bottom paneling, and discharge regulation. A scale model of a characteristic reach of the river was constructed to study methods of improving navigation conditions. The model represented the river over 5 km at 1/100 horizontal scale and 1/25 vertical scale with a movable bed. Three shoals were studied. Dredging and paneling were studied simultaneously with the model. The use of the bottom panel techniques in the actual river training works was described. It was concluded that for bottom panels it was necessary to be very attentive to the hydraulic limit conditions. If good conditions usually linked with the curve of the bank do not exist at the upstream part, they must be created by means of groins extending from the upstream bottom panels up to the bank. In some places these groins are connected with permeable bank protection groins. It is planned to extend navigation improvement to the sea so that an inland waterway of about 700 km will be available. (See also W75-05192) (Schicht-ISWS)
W75-05213

8B. Hydraulics

INTERIOR DRAINAGE STUDY, PUMPING PLANT B AREA, DALLAS FLOODWAY PROJECT,
URS Forrest and Cotton, Inc., Dallas, Tex.
Dallas, Texas, Department of Public Works, March 1971. 62 p, 30 fig, 29 tab.

Descriptors: *Storm runoff, *Drainage programs, *Flood control, *Detention reservoirs, *Urban runoff, Texas, Storm drains, Drainage engineering, Runoff, Sumps, Planning.
Identifiers: *Dallas(Texas).

The Corps of Engineers completed its investigations for interior drainage improvements in about 1953 and since that date, the topography of the Pumping Plant 'B' Area has been changed appreciably as developers have graded or filled low areas so that new construction would be above publicized flood levels. In view of the topographic changes, new aerial photographs were flown and topographic maps prepared to show 1970 conditions. Field surveys were made to determine the dimensions and controlling elevations of the drainage facilities affecting the flow of storm waters to the pumping stations and cross sections were run to check the sump storage areas. A field examination was also made of the existing pumping stations. The investigations showed that a high degree of development has taken place in all of the area contributing runoff to the existing pumping stations which results in a greater volume of water to be stored or discharged into the floodway. The increase in impervious areas brought about by development has also reduced the time of concentration of runoff into the sumps (stormwater detention areas) which further aggravates the flood problem. The investigations showed, in addition, that the sump storage capacity below design high water levels adopted by the Corps of Engineers had been decreased by about 43 percent by the filling of low areas for development. (Poertner)
W75-04859

INTERIOR DRAINAGE STUDY, WEST LEVEE, DALLAS FLOODWAY PROJECT,
URS Forrest and Cotton, Inc., Dallas, Tex.
Dallas, Texas Department of Public Works, September 1973. 78 p, 40 fig, 34 tab.

Descriptors: *Urban runoff, *Storm runoff, *Levees, *Detention reservoirs, *Flood control, *Drainage programs, Texas, Sumps, Urbanization, Storm drains, Drainage engineering, Runoff, Planning.
Identifiers: *Dallas(Texas).

The City of Dallas has adopted a 100-year frequency storm for design of drainage facilities throughout the City and it appears appropriate to consider the need for additional facilities for the West Levee Area on this basis. Runoff from the drainage area behind the floodway levee is stored in sump areas consisting of the old river channels, levee borrow ditches, and drainage ditches until it can be pumped into the floodway or discharged by gravity flow through the levee. The topography of the West Levee Area rises an average of about 1.2 feet per mile from Corinth Street upstream and because of this flatness, large areas of developed land can be flooded by a small increase in water levels once the sumps are filled. Consequently, in order to control the level of flooding and take full advantage of the storage capabilities of the sump areas, the West Levee area has been subdivided into three major areas designated as Pumping Plant 'C' Area, Pumping Plant 'D' Area, and the Eagle Ford Area. The investigation showed that new urban construction in the area protected by the West Levee has resulted in more rapid and greater runoff then originally anticipated and that flooding in some areas behind the levee would be experienced from the occurrence of the design storm. (Poertner)
W75-04860

CITY OF TORONTO SEWER SYSTEM,
Toronto Dept. of Public Works (Ontario).
For primary bibliographic entry see Field 8A.
W75-04864

ATTENUATION OF RANDOM DEEP WATER WAVES BY A POROUS WALLED BREAKWATER,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. P. Richey, D. B. Morden, and B. J. Hartz.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 690, $7.50 in paper copy, $2.25 in microfiche. Washington State Highway Department Research Program Report 13.1, August 1973. 236 p, 50 fig, 27 ref, 4 append. DOT Y-1307.

Descriptors: *Breakwaters, *Waves(Water), *Energy, *Bridges, *Winds, Hydraulic similitude,

Analytical techniques, Hydraulic models, Attenuation, Instrumentation, Statistical methods, Energy dissipation, Model studies.
Identifiers: *Porous walled breakwater, *Resonating chamber, Linear damped oscillator.

The porous walled resonating chamber, a type of breakwater, was investigated as a means of reducing reflected waves from structures subjected to random wind generated waves in deep water. Extending laboratory monochromatic studies to a full-scale apparatus appended to a floating bridge allows assessment of scale factors and the effects of random waves on the predicted performance of the device as a linear damped oscillator. The full-scale device was shown to be frequency selective at a frequency precisely corresponding to the predicted resonance of the system. The forces, measured on the porous wall, are lower than predicted and the device completely eliminates the problem of wave runup onto the bridge roadway. The porous wall resonating chamber can easily be appended to an existing structure or incorporated into a new structure. The consistency of results from the model and a full-scale prototype shows that the two systems are indeed hydraulically similar. (Singh-ISWS)
W75-05113

TO DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES,
Maine Dept. of Transportation, Augusta. Bureau of Highways.
For primary bibliographic entry see Field 4A.
W75-05130

PERMAFROST-RUNOFF: THE CONSULTING ENGINEER'S EXPERIENCE,
Bolter Parish Trimble Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 2C.
W75-05146

SOFAR CHANNEL AXIAL SOUND SPEED AND DEPTH IN THE ATLANTIC OCEAN,
Naval Undersea Center, San Diego, Calif.
J. Northrop, and J. G. Colborn.
Jounal of Geophysical Research, Vol 79, No 36, p 5633-5641, December 20, 1974. 8 fig, 33 ref.

Descriptors: *Atlantic Ocean, *Depth, *Oceanography, *Currents(Water), Antarctic, Channels, Mapping.
Identifiers: *Sound speed, *Sofar channel, *Sound propagation, Strait of Gibraltar, Submarine topographic features, Mediterranean Ocean.

Axial sound speed and depth of the Sofar channel in the north and south Atlantic were estimated and the seasonal variations that affect Sofar propagation examined. The estimates were derived from applying averaging techniques to archived oceanographic data. The computed values appeared to agree within one part per thousand with the measured data from long-range propagation experiments. A more accurate sound speed mapping method was recommended, as was the incorporation of measured values of speed and depth in any Sofar computer program. (Bhowmik-ISWS)
W75-05156

MEAN LENGTH OF RUNS OF OCEAN WAVES,
Chicago Bridge and Iron Co., Planfield, Ill. Marine Research and Development.
S. K. Chakrabarti, R. H. Snider, and P. H. Feldhausen.
Journal of Geophysical Research, Vol 79, No 36, p 5665-5667, December 20, 1974. 4 fig, 7 ref.

Descriptors: *Waves(Water), *Ocean waves, *Atlantic Ocean, Mathematical models, Computer models, Simulation analysis, Wavelengths, Hydraulics, Numerical analysis.
Identifiers: *Wave run length, *Spectra, *Spectral model, Wave heights.

The mean length of runs of wave heights and the mean number of waves between the exceedance of a certain level by a group of waves and the next exceedance of the same level by the succeeding group of waves were investigated for data from the March 1968 North Atlantic storm. These quantities were compared with corresponding results obtained from the numerical simulation of waves in a computer for both wide and narrow band spectra. (Bhowmik-ISWS)
W75-05160

CONTINUOUS HYDROLOGICAL TIME-SERIES DISCRETIZATION,
Technical Univ. of Lisbon (Portugal). Instituto Superior Tecnico.
For primary bibliographic entry see Field 2A.
W75-05165

RAINFALL TEMPORAL PATTERNS FOR DESIGN FLOODS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-05166

RESEARCH INTO UNSTEADY FLUID FLOW DURING TRANSIENT PROCESSES IN A SHORT PIPE,
D. N. Popov.
Russian Engineering Journal, Vol 54, No 6, p 7-9, 1974. 4 fig, 4 ref. Translated from Vestnik Mashinostroeniya, No 6, p 7-9, 1974.

Descriptors: *Pipe flow, *Unsteady flow, *Transition flow, *Pressure, Turbulence, Mathematical models, Reynolds number, Hydraulics.
Identifiers: *Short pipe, *Incompressible fluids, *Hydraulic resistence, Surface friction.

The results of experimental research on unsteady flow in short pipes were presented and a method for calculating the transient processes was explained. During the transient motion of a fluid in a short pipe, a change in the flow structure was observed which affected the variation in the total pressure-drop and in the fluid discharge with respect to time. The effect of the transient nature of the fluid flow on the pressure-drop in a short pipe was allowed for by introducing a correction into the equation of motion for uniform quasi-static flow. During the transient process the effect of the unsteady flow in a short pipe was noticed principally in those portions with average velocity values where the difference in velocity values, when compared with the values determined by the usual methods of calculation, reached as much as 20%. (Bhowmilk-ISWS)
W75-05171

SEDIMENT TRANSPORTATION, VOLUME I.
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 2J.
W75-05192

TWO DIMENSIONAL JET DIFFUSION ON SLOPING FLOORS UNDER FINITE SUBMERGENCE,
Alberta Dept. of Environment, Edmonton. Water Resources Div.
V. M. Hari.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 1-12. 7 fig, 1 tab, 9 ref.

Descriptors: *Jets, *Diffusion, *Laboratory tests, *Mathematical studies, Steady flow, Flow characteristics, Turbulent flow, Continuity equation, Reservoirs, Boundary layers, Hydraulics, Fluid mechanics, Evaluation, Velocity, Spatial distributions, Underflow, Momentum transfer.
Identifiers: Equation of motion, Two dimensional flow, Submerged jets, Sloping floors, Turbulent wall jet.

Knowledge of the dispersion characteristics of buoyant jets and jets on sloping floors under finite submergence would help in understanding the reservoir sediment deposition process. A theoretical and experimental study of two dimensional jets diffusing on sloping floors under finite submergence was made. The turbulent wall jet model was used to derive simple power-law type mathematical expressions for the decay of jet velocity, growth of jet, and the bed shear stress distribution. These mathematical predictions werr correlated with the experimental observations. Observations were also made on the velocity distribution in the boundary layer and presented graphically. It was concluded that: (1) the theoretical analysis, inspite of some simplifying assumptions, predicts the scale variations reasonably well; (2) the turbulent wall jet model is quite useful for predicting some of the mean flow characteristics; (3) the boundary layer velocity distribution when correlated with ratio of (velocity at point y) / (maximum velocity in section) and the ratio of (depth y from bed) / (normal depth from bed to where velocity is half of the maximum velocity) was found to be good; and (4) further study in regard to turbulent characteristics would help in the analysis of sediment laden jet diffusion. (See also W75-05192) (Humphreys-ISWS)
W75-05193

ANALYSIS OF AGGRADATION UPSTREAM OF A DAM,
Roorkee Univ. (India). Dept. of Hydraulic Engineering.
R. J. Garde, and P. K. Swamee.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 13-22, 3 fig, 4 ref.

Descriptors: *Aggradation, *River beds, *Mathematical studies, *Alluvial channels, Deposition(Sediments), Profiles, Dams, Upstream, Sediment transport, Analytical techniques, Equations, Backwater, Continuity equation, Methodology, Fourier analysis, Flow resistance, Finite element analysis, Numerical analysis.
Identifiers: River mechanics.

The problem of predicting transient bed profiles upstream of a dam in an alluvial stream is important. The existing methods for numerical computation are time consuming and the stability of resulting solutions over a large number of cycles is not known. A new iterative method was described for predicting the deposition profile upstream of a dam. The iterative procedure converges rapidly. The profile obtained after using the iterative method at the end of each time interval was smoothened by use of a Fourier Sine Series. The use of this method permitted larger time and space intervals than those used in the method of characteristics. The method was also found to yield a stable solution over a large number of cycles. Example results were given in graphs. (See also W75-05192) (Humphreys-ISWS)
W75-05194

STUDY ON LOCALISED SCOUR AROUND A BRIDGE PIER AND ITS PREVENTION,
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
H. Kikkawa, S. Fukuoka, and H. Sogawa.

In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 105-116. 7 fig, 1 tab, 7 ref.

Descriptors: *Scour, *Flow around objects, *Stream erosion, *Laboratory tests, Bridges, Piers, Erosion, Sands, Open channel flow, Alluvial channels, Froude number, Evaluation, Dimensional analysis, Theoretical analysis, Erosion control, Hydraulic structures, Hydraulics, Hydraulic models, Model studies.
Identifiers: River mechanics, Movable beds, Cylinders.

The mechanics of scouring around a pier was investigated experimentally in a laboratory flume with an erodible bed. Cylinders were used to model bridge piers. A method for preventing scouring was explored both experimentally and theoretically. When the Froude number of flow was larger than F = 0.25, maximum scour around a pier occured in the front portion of a cylinder and the ratio of maximum depth of scour, d, to flow depth, h, was described in terms of d/h = alpha times F to the 3/4 power. Alpha is a constant which depends on channel width, pier width and bed material. Observing that the downward flow caused by the vertical velocity gradient of the flow has a primary role on the scour, it was found that guards of concentric circular plants attached to a cylinder are useful for scour reduction around a pier. Theoretical basis for the availability of guards on scour reduction was provided by the two-dimensional potential flow theory. The guards with B/A approaching a value of 3.0, the ratio of spacing A to width B, contributed most effectively to scour reduction. The appropriateness of the value was verified theoretically by applying the concept of the strip roughness. The scour depth around a pier of various shapes and sizes in natural streams can be predicted by the results obtained, but the verification based on the model test of large scale and numerous data collected from natural streams is still desired. (See also W75-05192) (Humphreys-ISWS)
W75-05201

DEFORMED PIERS TO CONTROL THE DOWNSTREAM EROSION,
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.
H. Shi-Igai.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 117-126. 5 fig, 2 tab, 3 ref.

Descriptors: *Scour, *Flow around objects, *Erosion control, *Laboratory tests, Stream erosion, Piers, Shape, Downstream, Upstream, Hydraulic models, Model studies, Evaluation, Dimensional analysis, Hydraulic structures, Erosion, Alluvial channels, Hydraulics, Open channel flow.
Identifiers: River mechanics, Movable beds, Bulbhead piers.

In order to eliminate the scour around piers, the effect of a bulbhead was tested. The bulbhead attached to the upstream side of a pier generates a standing wave that minimizes the standing wave height caused by the pier. It was found that the standing wave was reduced and the scour at the back of the pier was drastically reduced, while the front scour received little effect. (See also W75-05192) (Humphreys-ISWS)
W75-05202

INCIPIENT MOTION OF BED MATERIAL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
S. P. Chee, H. G. Payne, and T. Kung.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 127-136. 3 fig, 1 tab, 5 ref.

Descriptors: *Streambeds, *Jets, *Laboratory tests, *Model studied, Hydraulic models, Hydraulics, Evaluation, Velocity, Movement, Dimensional analysis, Flow, Stream erosion, Beds, Erosion control, Critical flow.
Identifiers: Bed material, Incipient motion, Cubical blocks, Critical velocity, Plunging jets.

Laboratory observations were made to study the incipient motion of bed materials exposed to streamflows which have velocity filaments sensibly parallel to the bed as well as to blocks located at the impact zone of falling water nappes from overflowing sharp-edged weirs. Dimensionless equations giving the critical velocity required to initiate movement of the bed material in horizontal flow and the conditions needed to cause the instability of blocks subjected to plunging water jets from weirs were presented. These non-dimensional equations will be useful to the hydraulic designer. (See also W75-05192) (Humphreys-ISWS)
W75-05203

SCOUR AT DOWNSTREAM END OF DAMS IN TAIWAN,
National Taiwan Univ., Taipei. Dept. of Civil Engineering.
C. M. Wu.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 137-142. 1 fig, 2 tab, 2 ref.

Descriptors: *Scour, *Dams, *Outlet works, Cavitation, Channel erosion, Running waters, Stream erosion, Hydraulics, Spillways, Tailwater, Fluid mechanics, Model studies, Hydraulic structures.
Identifiers: Scour hole, *Taiwan.

Prototype and model scour data at the downstream end of dams in Taiwan were analyzed and an empirical equation for predicting the limiting scour depth was proposed. Studies of available data showed that almost 80% of the total energy from the spill water is dissipated in the river bed where the scour hole is formed, irrespective of its type of structure. Hence, from a practical point of view, an empirical approximation based on the scour data can be developed for the limiting scour depth. (See also W75-05192) (Jess-ISWS)
W75-05204

SEDIMENTATION DAMAGE OF HYDRAULIC STRUCTURES IN TAIWAN,
Taiwan Water Resources Planning Commission, Taipei. Hydraulic Lab.
C. M. Wu.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 143-154. 7 fig, 2 ref.

Descriptors: *Dams, *Hydraulic structures, *Repairing, *Rehabilitation, *Sedimentation, Concrete structures, Reservoir silting, Erosion, Sluices, Spillways, Cavitation.
Identifiers: *Taiwan.

Sedimentation damage sustained by hydraulic structures in Taiwan is severe. Various kinds of damage discussed included: (1) land slide and river sedimentation to the normal operation of hydraulic structures, (2) abrasive erosion of concrete surfaces associated with hydraulic jumps in diversion tunnels and stilling basins resulting from the presence of solid matter in the turbulent flows, and (3) cavitational erosion of concrete in chute floors of high-head sluiceways. The techniques developed for corrective and preventive maintenance were discussed. (See also W75-05192) (Jess-ISWS)
W75-05205

MODELING OF LOCAL SCOUR AROUND SPUR DIKES IN STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. K. Tyagi.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 155-165. 4 fig, 2 tab, 14 ref, 2 append.

Descriptors: *Scour, *Hydraulic structures, *Model studies, *Laboratory tests, Dikes, River training, Alluvial channels, Sediments, Sands, Movement, Evaluation, Dimensional analysis, Depth, Flow, Streams, Rivers, Open channel flow, Hydraulic models, Froude number, Velocity.
Identifiers: River mechanics, Spur dikes.

A theoretical and experimental study was conducted on local scour around a spur dike. The depth of scour was related to various characteristics of the fluid, sediment, flow, alluvial stream, and spur dike. Dimensional analysis showed that the scour Froude number depends on the relative approach depth and the constriction ratio. Experimental data on maximum depth of scour was given for three sediments - the plastics, coke, and sand. Data were obtained over a wide range of sediment sizes and constriction ratios. Utilizing nondimensional parameters, data were analyzed for the maximum scour depth around a spur dike normal to the flow, for the case of no or little sediment movement. It was concluded that: (1) the maximum depth of scour is affected significantly by size and submerged specific gravity of the sediment; (2) the constriction ratio (Spur dike width/channel width), beta, is a relevant parameter that considers the geometry of the spur dike, and it is important in determining the scour depth; (3) the relative approach depth, which is a ratio of the apporach depth of flow and the sediment size, also influences the scour depth; and (4) with known values of mean flow velocity, flow depth, sediment size finer than 50%, beta, specific weight difference between sediment and water, the maximum scour depth can be determined. (See also W75-05192) (Humphreys-ISWS)
W75-05206

THE EFFECT OF SILLS ON RIVER BED,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
P. Volkart, J. Tschoop, and E. Bisaz.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 167-178. 11 fig.

Descriptors: *Scour, *Erosion control, *Model studies, *Laboratory tests, River beds, Alluvial channels, Depth, Shape, Erosion, Stream stabilization, Discharge(Water), Sediments, Size, Sediment transport, Riprap, Hydraulic structures, Barriers, Hydraulic models, Evaluation.
Identifiers: River mechanics, Transverse sills.

General statements were derived for the two-dimensional steady stress case on the basis of model tests. They define the size of the scouring

basin between transverse sills in the natural river bed. They also indicate the great influence of sill spacing on scouring depth and stability of the scouring basin. A basis was laid for computing the dimensions of a riprap protecting the natural bed in relation to the discharge, the gradient, and the arrangement of sills. A possible application of the test result to natural conditions was tabulated. (See also W75-05192) (Humphreys-ISWS)
W75-05207

THEORY OF VISCOUS FLOW IN WIDE CURVED OPEN CHANNELS,
Technische Hogeschool, Delft (Netherlands). Lab. of Fluid Mechanics.
H. J. De Vriend.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 179-190. 11 fig, 4 ref.

Descriptors: *Viscous flow, *Open channel flow, *Mathematical studies, *Analytical techniques, Fluid mechanics, Mathematical models, Theoretical analysis, Equations, Continuity equation, Flow characteristics, Velocity, Distribution patterns, Profiles, Shallow water, Hydraulics, Channels, Flow.
Identifiers: Navier-Stokes equations, Curved channels, Rectangular channels.

The axisymmetrical viscous flow in a shallow curved open channel with a constant rectangular cross section and a fixed horizontal bed was investigated by using the method of matched asymptotic expansions in three separate regions of the cross section. This yields velocity-components that can be written as the product of two functions, one of which requires recomputation for every new channel geometry, while the other one does not. A simple interpolation between the three regions was possible, affecting only the former functions. The results of this approximation showed a good agreement with the numerical solution of the system of differential equations for the entire cross section, given by Ananyan (1965). However, the approximation developed requires much less computation. (See also W75-05192) (Humphreys-ISWS)
W75-05208

SECONDARY CURRENTS IN SUBSEQUENT MODEL BENDS,
Karlsruhe Univ., (West Germany). Theodor-Rehbock-Lab. for River Improvement.
E. Mosonyi, and W. Goetz.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 191-201. 7 fig, 10 ref.

Descriptors: *Flow characteristics, *Open channels, *Hydraulic models, *Laboratory tests, Flow, Distribution patterns, Dimensional analysis, Analytical techniques, Curves, Currents(Water), Flumes, Hydraulics, Open channel flow, Velocity.
Identifiers: *Secondary flow, Spiral flow.

Some characteristics of flow in model bends with rigid bottoms were studied and special regard was given to the intensity of secondary flow and its variation along the channel. The governing parameters of secondary motion for different reaches of the flow was determined by dimensional analysis. Hot-film anemometry was used to measure the magnitude and direction of the velocity vector. The intensity of the secondary flow was defined as the ratio of kinetic energy of the spiral velocity component to that of the main flow component. It was shown in the experiments that spiral flow can be described by the variation of its intensity. The two flumes erected for this research were described. The results of the measurements were illustrated by profiles of the velocity components for significant flow patterns in both flumes. The variation of spiral flow intensity under various conditions was presented. (See also W75-05192) (Humphreys-ISWS)
W75-05209

ECONOMIC REVETMENTS FOR PROTECTING THE BANKS OF MERIC AND ERGENE RIVERS FLOOD CANALS AGAINST WAVE EROSION,
State Hydraulic Works, Ankara (Turkey). Dept. of Research.
S. Bursali.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 203-212. 8 fig, 6 ref.

Descriptors: *Flood damage, *Flood protection, *Flood control, *Retaining walls, Floods, Levees, Waves(Water), Erosion, Canals, Riprap, Bank protection, Slopes, Scour, Shoreline cover, Vegetation, Cohesive soils.
Identifiers: *Turkey(Meric River-Ergene River).

Flood levees constructed along the Meric and Ergene Rivers to protect agricultural lands against flood damage were observed and studied analytically in order to find out the main cause of damage on the water side slopes. It was determined analytically that the tractive force on the slopes keeps its value of being smaller than the critical tractive force on the bottom. On the contrary, by studying wave effects, it was found that the dynamic action of waves is the main cause of slope erosion. Thus, the type of revetment and weight of natural or artificial stones resistant to the wave effects was determined. (See also W75-05192) (Visocky-ISWS)
W75-05210

STABILITY OF TIDAL RIVERS AND METHODS FOR DETERMINATION OF THE CORRECTIVE WORKS,
Calcutta Port Commissioners (India).
S. C. Roy.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 251-264. 6 fig, 1 tab, 9 ref.

Descriptors: *Rivers, Tidal waters, *Sedimentation, *Stream stabilization, Tidal effects, Tidal streams, Tides, River training, Channel erosion, Scour, Stream erosion, Model studies, Hydraulic models, Erosion, River regulation, History.
Identifiers: *Tidal river stability, Channel geometry, *India(River Hooghly), Spurs.

Methods for determining the stability of tidal river systems were discussed. The stability was identified when there is no erosion or accretion in the system. The methods for determining the stability were grouped in two broad categories: (1) analysis of historic data, and (2) analysis of hydraulic parameters from model data. When historic data of tides, channel geometry, and freshwater flow are available over long periods, the determination of the stability can be conveniently made. When, however, such data are not available, the state of stability can be assessed by analyzing the hydraulic parameters from model data. In a stable tidal system the training works require determination of the size of the spurs in relation to the expected improvement in the post-training period. From the basis of information obtained from prototype and hydraulic models, an empirical relationship was suggested for such determination. The importance of sequencing the training works in context to the changes that occur in the tidal system was pointed out. (See also W75-05192) (Sanderson-ISWS)
W75-05214

SETTLING CUM FLUSHING TANK ON TRISULI POWER CHANNEL,
Central Water and Power Research Station, Poona (India).
C. V. Gole, S. V. Chitale, and V. K. Kulkarni.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 265-275. 2 fig, 5 ref.

Descriptors: *Sediment control, *Model studies, *Settling basins, *Hydraulic structures, Separation techniques, Desilting, Suspended load, Bed load, Design, Canals, Open channels, Diversion structures, Bypasses.
Identifiers: *Sediment removal, Flushing tanks.

A settling tank with flushing arrangements for excluding sediment, except wash load, from a canal supplying water to a hydroelectric powerplant was designed. Final design was determined from model studies. Conclusions from the model studies were: (1) Coarse and medium sediment can be excluded from the canal to any desired extent by providing a settling cum flushing tank in a water conductor system situated in hilly regions where ample head from the tank to parent river would be available. (2) The design of the tank would be simpler and economical if all the canal supplies could be utilized for a limited period during flushing. (3) If diverting all canal discharge for flushing is not permissible, the settling tank will have to be subdivided into compartments. Flushing of one compartment can be done simultaneously with the other compartment working as the settling tank. (4) The compartment of the tank may be subdivided into flushing channels, and determining width and number by considering the discharge that could be spared and head available for the flushing. (5) If full supply is required all the time to the power canal downstream of the tank, it is necessary to design the upstream canal and the desilting tank for the extra discharge needed for flushing. (See also W75-05192) (Humphreys-ISWS)
W75-05215

INFLUENCE OF SUSPENDED SEDIMENT DISTRIBUTION ON SETTLING BASIN DESIGNS,
Mahaweli Development Board, Colombo (Sri Lanka).
U. T. B. Hippola.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 277-288. 2 fig, 9 ref.

Descriptors: *Sedimentation rates, *Settling basins, *Design, Suspended solids, Sediment distribution, Particle size, Model studies, Theoretical analysis, Statistical methods, Probability, Sediments, Silts, Laboratory tests.

Present methods of dimensioning settling basins in hydro-power and irrigation systems do not generally consider the actual vertical distribution of sediment. Diffusion and gravitational theories of sediment transport were applied in theoretical and experimental investigations to determine a design technique that reduced settling basin length approximately 30 to 40% when compared to other design methods. Based on these investigations, the following conclusions and recommendations for settling basin design were made: (1) Probability methods of settling basin design have a sound theoretical basis and can be used as standard methods for determining economical dimensions.

(2) Particles in motion in turbulent flow deflect from their mean trajectory in accordance with the Gauss law of normal distribution. (3) The assumption of constant vertical distribution of suspended sediment concentration seriously affects the computation of settling basin dimensions. Assuming trapezoidal or triangular vertical distribution or vertical distribution in accordance with the gravitational theory, a more general formula for settling basin design was obtained. (4) When adequate data on silt is not available it was suggested that a triangular vertical distribution be adopted and the curves presented for estimating basin dimensions be used. (See also W75-05192) (Humphreys-ISWS)
W75-05216

WATER INTAKE PROBLEMS IN TORRENTS,
Technical Univ., of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
K. Cecen.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 289-300. 6 fig, 9 ref.

Descriptors: *Sediment control, *Hydraulic structures, *Intakes, Model studies, Laboratory tests, Intakes structures, Sediment transport, Running waters, Sediments, Sands, Gravels, Bed load, Bypasses, Diversion structures, Mountains, Streams, Rivers.
Identifiers: Frontal intakes.

For mountain streams on steep slopes that transport a large sediment load, it is not possible to state a general rule for the choice of an intake system. Model studies and prototype experiences were described. Lateral intakes must be located at the outer sides of natural or artificial bends. With the help of spurs, sills, submerging walls, gates, etc., it may be possible to divert as much as 50% of the water in streams with large sediment loads. In the frontal intake system, secondary currents and eddies are eliminated inside a sufficiently long gravel pass and a reasonably isotropic turbulence is achieved. Water was taken from the upper layers with no change of direction. By flushing the lower layer continuously as a kind of boundary layer suction, 90% or more of the water can be diverted free of sediment. Bottom intake was the best choice for streams on very large slopes carrying very coarse sediment. Frontal and bottom intakes were constructed together on a stream of slope 0.043 and it was found that the frontal system gave better results. (See also W75-05192) (Humphreys-ISWS)
W75-05217

THE VELOCITY DEFECT LAW AND THE SEDIMENT TRANSFER COEFFICIENT IN AN OPEN CHANNEL,
Africultural Research Service, Oxford, Miss. Sedimentation Lab.
N. L. Coleman.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 317-323. 3 fig, 7 ref.

Descriptors: *Sediment distribution, *Boundary layers, *Laboratory tests, Suspended solids, Evaluation, Sediments, Sands, *Open channel flow, Velocity, Hydraulics, Profiles, Distribution patterns.
Identifiers: *Velocity defect law, *Sediment transfer coefficient, Sediment concentrations.

The sediment transfer function and the velocity defect laws for boundary layer flow in a smooth rectangular channel were investigated for a constant flow with systematically increasing suspended sediment concentration. The sediment transfer function appeared to be the same for all values of average suspended sediment concentration. Universal forms of the velocity defect law, including the sediment transfer coefficient as a variable, were found for both the inner and outer parts of the boundary layer. (See also W75-05192) (Humphreys-ISWS)
W75-05218

TURBULENCE MEASUREMENTS OVER SAND BEDS,
California State Univ., Sacramento. Dept. of Civil Engineering.
A. L. Prashuhn.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 325-336. 8 fig, 1 tab, 11 ref.

Descriptors: *Turbulence, *Open channel flow, *Laboratory tests, Turbulent flow, Velocity, Profiles, Supercritical flow, Measurement, Evaluation, Beds, Sands, Open channels, Fluctuations, Instrumentation, Hydraulics.
Identifiers: River mechanics.

Results were presented of turbulence measurements in water flows over sand beds. A hot-film anemometer with a conical probe was used and the longitudinal turbulence determined. Restricted primarily to the flat bed regime, mean and fluctuating velocity profiles were given. The turbulence levels were compared with existing smooth and rough boundary turbulence data and analyzed with respect to the Reynolds number. Conclusions were: (1) Based on the comparisons with clear water data, including the turbulent and time-averaged velocity profiles, the observed logarithmic velocity distributions and von Karman k values, it appears that the anemometer gives reliable and repeatable values of both the mean and turbulent velocities in flows over sand beds. (2) The sand bed in the Froude number range of 1.1 to 1.5, generally considered smooth because of the low resistance coefficients associated with it, has turbulence profiles above it more nearly like a smooth boundary than a rough one. (3) The turbulence profile above the sand bed, unlike that above either a smooth or rough boundary, is distinguished by a thick, nearly constant, high turbulence region with a thickness of the same order as the heavy sediment concentration. (4) The relative turbulent intensities decrease with increasing Reynolds number at all depths. Near the surface this decrease is at the same rate as clear water flows over smooth boundaries. (See also W75-05192) (Humphreys-ISWS)
W75-05219

FLOW RESISTANCE IN SAND BED CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Civil Engineering.
C. C. Villanueva, and J. A. Maza Alvarez.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 337-345. 2 fig, 1 tab, 11 ref.

Descriptors: *Flow resistance, *Open channel flow, *Alluvial channels, On-site data collections, Rivers, Evaluation, Streams, River beds, Sands, Hydraulics, Boundaries(Surfaces), Regime.
Identifiers: *River mechanics.

A dimensionless diagram and alternative formulas to determine the flow velocity in sand bed channels as a function of depth, slope and bed material characteristics, for any flow regime, were presented by Cruickshank (1968). The analysis was mainly based on laboratory tests, with few river data. For the study presented, a large quantity of river measurements was available with widely varying river characteristics. With this data, it was possible to verify the consistency of the first analysis and also to extend its applicability to a wider range of conditions. The criteria and method of practical use of results were given for any flow regime. Another advantage of the method is that it consists of simple formulas, which can be readily used in computer programs for river flow simulation and also to establish regime equations together with a sediment transport formula and a geometric relationship. The formulas presented are only valid for sand median sizes from 0.2 to 2.0 mm; further research is needed to include cases outside these limits. (See also W75-05192) (Humphreys-ISWS)
W75-05220

FLOW AND RESISTANCE CHARACTERISTICS OF SAND BED CHANNELS,
Colorado State Univ., Fort Collins. Engineering Research Center.
K. Mahmood, and D. B. Simons.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 347-358. 2 fig, 6 ref.

Descriptors: *Alluvial channels, *Flow resistance, *Boundary layers, *Flow characteristics, Open channel flow, Velocity, Profiles, Regime, Shape, Beds, Sands, Hydraulics, Roughness(Hydraulic), Sediment transport, Equations, Flow.
Identifiers: Two-layer model, Movable beds.

An empirical two-layer model of the velocity distribution in sand bed channels was developed. Integration of this distribution yielded a relation between the effective shear velocity in the inner layer and the average velocity of flow. This relation can be used to determine the vertical velocity profile if average velocity in the vertical is known. The resistance to flow in sand bed channels is related to the regime of the flow. A criterion was developed to predict this regime from known bed material, depth, and energy gradient. Resistance functions for sand bed channels were also developed. These functions can be used to predict the average velocity if the bed material, depth, and slope are known. (See also W75-05192) (Humphreys-ISWS)
W75-05221

STUDIES ON BED-LOAD TRANSPORT RATE IN OPEN CHANNEL FLOWS,
Kyoto Univ. (Japan). Disasters Prevention Research Inst.
K. Ashida, and M. Michiue.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 407-418. 9 fig, 15 ref.

Descriptors: *Alluvial channels, *Sediment transport, *Sediment discharge, *Open channel flow, Bed load, Flow resistance, River beds, Bottom sediments, Movement, Flow, Regime, Theoretical analysis, Equations, Cohesionless soils, Sands, Gradation, Sediments, Roughness(Hydraulic).
Identifiers: River mechanics.

The bed roughness in alluvial channels has a large effect on the bed load transport rate. Therefore, in order to estimate accurately the bed load discharge, the effect should be introduced into a bed load function. An analysis developed a procedure for estimating the effective shear stress for bed load transportation with Einstein's concept that the total shear stress is divided into two parts, resistance of surface friction and the form resistance. A formula was developed for the bed

load transport rate by using the effective shear stress. Although the formula for the bed load transport rate was derived for the uniform sand grains, it was also indicated that the formula may be applicable for non-uniform sediment by using the critical shear velocity for each individual grain in the graded sediment. A method was presented for estimating the hydraulic resistance in alluvial channels on the basis of dimensional analysis and consideration of the flow regime. (See also W75-05192) (Humphreys-ISWS)
W75-05226

INVESTIGATION AND COMPUTATION OF SEDIMENT TRANSPORT WITH REGARD TO THEIR DENSITY,
Moskovskii Institut Inzhenerov Zheleznodorozhnogo Transporta (USSR).
G. V. Zheleznyakov, V. S. Altunin, and V. K. Debolski.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thialand, p 525-536, 5 fig, 6 ref.

Descriptors: *Sediment transport, *Hydraulic models, *Laboratory tests, Sediment discharge, Bed load, Suspended load, Sediments, Density, Discharge(Water), Open channel flow, Velocity, Particle size, Beds, Shape, Dunes, Flow.
Identifiers: Movable beds, River mechanics.

Described were the results of laboratory investigations of transportation of bed-load and suspended sediments with sands of the different granulometric composition and easily movable synthetic materials. The experiments were conducted in a recirculation system with flow velocities and heights of dunes (sand waves) varying widely. The effect of sediment density on dune parameters was studied. Criterial relations between sediment discharges and flow parameters and particle characteristics for various forms of sediment transportation into a flattened-out form was determined. Scale factors determined for the distorted model of sediment transport considered sediment density and the relationship between sediment discharge and flow velocity. Experiments verified these model-scale factors for simulating river bed processes. (See also W75-05192) (Humphreys-ISWS)
W75-05234

SEDIMENT DIFFUSION OVER A WAVY, MOBILE BED,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
R. P. Apmann.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 561-572, 2 fig, 18 ref.

Descriptors: *Sediment transport, *Open channel flow, *Laboratory tests, *Streambeds, Diffusion, Movement, Turbulent flow, Turbulence, Eddies, Evaluation, Cohesionless soils, Suspended load, Settling velocity, Mixing, Equations, Shear, Flow, Entrainment, Beds, Velocity, Dunes, Streams, Shape, Sediments, Suspended solids, Flumes.
Identifiers: River mechanics, Vertical diffusion, Mobile beds.

It was hypothesized that the turbulence generated over wavy, mobile beds differs in its characteristics from the turbulence generated over plane beds and, therefore, that the characteristics of sediment diffusion in the two cases differs, leading to differences between experiments made under the two conditions. A comparison between such studies failed to substantiate that hypothesis and indicated the opposite. The fall velocity of the sediment was again shown to be an important variable in the diffusion process. Theoretical backing was given for this analysis, but the nature of the relationship between the fall velocity and the diffusivity has not been fully explored and sufficient data is not available to define the relationship. For the theories of sediment diffusion to be of maximum usefulness to those working on problems of river engineering, additional investigations are needed to explore the relations between fall velocity, depth, water velocity, and diffusion coefficient. Since differences appear between studies which are in themselves consistent, the suggested research must be sufficiently comprehensive to define the variables which create flume effects. (See also W75-05192) (Humphreys-ISWS)
W75-05237

A PROBABILISTIC METHOD FOR DETERMINING THE DISTRIBUTION OF SUSPENDED SOLIDS IN OPEN CHANNELS,
Queens Univ., Kingston (Ontario).
M. S. Yalin, and B. M. Krishnappan.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 603-614. 5 fig, 14 ref.

Descriptors: *Statistical models, *Suspended solids, *Channels, Sediment distribution, Probability, Markov processes, Movement, Flow, Evaluation, Equations, Statistical methods, Turbulent flow, Spatial distribution, Dispersion, Diffusion, Stochastic processes.
Identifiers: *River mechanics, Gaussian distribution.

The ordinates of the random path of a suspended particle drifted by the turbulent flow were considered as a Markovian sequence in time, each step being of the same infinitesimal duration. The normal (Gaussian) distribution was used only as the transitional function expressing the displacement of a particle during the infinitesimal time interval separating the steps. The probability density distributions corresponding to consecutive steps were generated with the aid of the Kolmogorov-Chapman equation. The final concentration distribution corresponding to a given stage of the flow was determined as an unlimited sum of these density distributions. The family of the concentration distribution curves determined was discussed in the light of experimental data. (See also W75-05192) (Humphreys-ISWS)
W75-05240

SPECTRAL PROPERTIES OF ALLUVIAL BED FORMS IN RIVERS AND FLUMES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. F. Cheong, and H. W. Shen.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 639-651, 6 fig, 1 tab, 9 ref. NSF Grant GK-11499.

Descriptors: *Alluvial channels, *Streambeds, *Frequency analysis, *Shape, Histograms, Rivers, Flumes, River beds, Statistical methods, Profiles, Data collections, Laboratory tests, Sand waves, Ripple marks, Sediments, Variability.
Identifiers: Spectral properties, Wave number, Spectral density.

The available spectral data on alluvial bedforms in laboratory flumes and in rivers were presented. With the possible exception of the data from the conveyance channel reported by Nordin and Algert, the high wave number range of each spectrum appears to follow a general straight line giving the '-3 power' spectral form. This seems to agree with Hino's similarity analysis. It was assumed that (1) the '-3 power' spectral form exists for the high wave number range and (2) there is similarity among the wave number spectra. For runs where the width of the channel exceeds three feet, a regression curve between the standard deviation of the bed elevation and the pertinent hydraulic variables was obtained. It was shown that if a ripple can be represented by a periodic function of a characteristic triangular form, the exponent of the line spectrum varies from -4 to -2 as the wave number increases. A preliminary investigation on the spectral properties of a bed composed of a series of statistically similar triangles arranged in tandem to simulate a ripple run was initiated. The spectrum, though multipeaked, showed a -4 power form over the high wave number range. This appears to agree with the experimental results on ripples by Taylor. (See also W75-05192) (Humphreys-ISWS)
W75-05242

EFFECT OF CHARACTERISTICS OF BED MATERIAL AND FLUID ON RIPPLE FORMATION,
Roorkee Univ. (India). Dept. of Civil Engineering.
P. P. Sahgal.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 653-665, 2 fig, 3 tab, 7 ref.

Descriptors: *Sediment transport, *Ripple marks, *Laboratory tests, Cohessionless soils, Bed load, Liquids, Water, Shear, Flow, Froude number, Movement, Viscosity, Sands, Granules, Sediments, Physical properties, Shape, Beds, Flumes, Open channels.
Identifiers: Water-glycerine mixtures, Kerosene oil-mobil oil mixtures, Movable beds, Grain seed, Oil seed.

Laboratory experiments were conducted in a recirculating 15 cm by 15 cm by 5 m long flume to study the mechanism of ripple formation on a granular bed. It was found that the Froude number, the shear stress, the particle size density of the bed material, and the fluid viscosity have a marked effect on the rippling phenomenon. Ripples formed only when the boundary was smooth or in transition from smooth to rough, that is, only when a laminar sublayer was present. Viscosity inhibits rippling for smaller grain size material and it promotes rippling for larger size material. The density of the particles seemed to have the same effect on rippling as the fluid viscosity; however, this conclusion was not verified. (See also W75-05192) (Humphreys-ISWS)
W75-05243

CONDITION FOR THE FORMATION OF ALTERNATE BARS IN STRAIGHT ALLUVIAL CHANNELS,
Waseda Univ., Tokyo (Japan). Dept. of Science and Engineering.
N. Sukegawa.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 679-689, 3 fig, 2 tab, 23 ref.

Descriptors: *Alluvial channels, *Channel morphology, *Laboratory tests, Sediment transport, Regime, Shape, Beds, Streambeds, River beds, Evaluation, Dimensional analysis, Sediments, Dunes, Hydraulic similitude, Hydraulics, Ripple marks.
Identifiers: *River mechanics, Antidunes, Alternate bars, Flat bed.

Experimental laboratory data were analyzed to determine the conditions under which alternate

bars form in alluvial channels. Two dimensionless parameters, A and B, were derived by dimensional analysis to establish the criterion for defining the region of alternate bar formation. Parameter A equals the square of (shear velocity)/(critical shear velocity). Parameter B equals the product of (shear velocity/critical shear velocity) and the square root of (channel surface width times channel slope/hydraulic radius). It was determined graphically that alternate bars formed when A is equal to or less than 5 times B raised to the 2/3 power. The bed form consisted of ripples, dunes, antidunes, or a flat bed for larger values of A. It was found from the criterion that alternate bars can be formed when the shear stress on the bed and the depth-width ratio of the channel flow is small, and that the critical value of this ratio for alternate bar formation depends on the properties of the fluid, flow, and bed material. (See also W75-05192) (Humphreys-ISWS)
W75-05245

STABLE CHANNELS IN ALLUVIUM,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Civil Engineering.
J. A. Maza Alvarez, and C. C. Villanueva.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technolology, Bangkok, Thailand, p 715-722, 8 ref.

Descriptors: *Channels, *Alluvial channels, *Open channels, *Stream stabilization, *Scour, Channel erosion, Open channel flow, Bank stability, Sediment control, Slope stability, Beds, Hydraulics, Alluvium, Erosion, Cohesionless soils, Canals, Flumes, Sediment transport, River training.
Identifiers: *Lacey's equations, *Stable channel design, River mechanics.

In order to describe the three degrees of freedom of a stream in alluvium, three independent equations are needed to determine its stable shape. It was shown that such equations may be: a resistance equation, a load transport equation, and a geometric relationship for the hydraulic section (e.g., a width to depth ratio). Starting with three such independent relationships for flow over a sand bottom, a set of three equations was established that define the geometry of a stream as a function of its discharge, sediment transport, and type of channel material. The obtained formulas agree very closely with observations in streams with dynamic equilibrium (regime streams). Their advantage over regime equations is that coefficients are functions of readily obtainable sediment characteristics. Their usefullness in design of river works and earthen channels is evident. (See also W75-05192) (Sanderson-ISWS)
W75-05248

CHANNEL STABILITY IN RELATION TO BURIED UNCONSOLIDATED SEDIMENTS,
Dundee Univ., Newport-on-Tay (Scotland). Tay Estuary Research Center.
A. T. Buller, and J. McManus. 21In: Sediment Transportation, Vo
W75-05249

STABLE CHANNELS IN ALLUVIAL MATERIAL,
Regional Inst. of Tech., Jamshedpur (India). Dept. of Applied Mechanics.
S. V. K. Sarma.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 735-747, 1 fig, 1 tab, 9 ref.

Descriptors: *Channels, *Alluvial channels, *Stream stabilization, *Scour, *Tractive forces, Open channels, Channel erosion, Open channel flow, Bank stability, Sediment control, Slope stability, Beds, Hydraulics, Alluvium, Erosion, Cohesionless soils, Froude number, Canals, Flumes.
Identifiers: *Stable channel design, River mechanics.

The principles of design of stable channels in coarse non-cohesive material were studied by the application of tractive force analysis. Trapezoidal channels were investigated, but similiar principles can be equally applied to sections of any other shape channels. The method of approach by tractive force proved to be generally applicable for clear water channels. The Froude number criterion must be less than 0.3 for a channel to have no appreciable bed and bank scour. This is acceptable in alluvium of sand-size range and finer. There is a minimum slope necessary for channel sections to be stable from tractive force considerations, above the limit of which all sections will be safe. In the stable condition, the discharge bears a definite relation with wetted perimeter, wetted area, and hydraulic mean depth. The theoretical equations for velocity distribution are not applicable for channels in erodible material. However, a logarithmic law holds good for trapezoidal channels flowing comparatively free of sediment. (See also W75-05192) (Sanderson-ISWS)
W75-05250

DESIGN OF SCOUR-FREE CHANNELS ON MILD SLOPES,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
B. A. Christensen.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 749-760. 7 fig, 12 ref.

Descriptors: *Scour, *Sediment control, *Channels, *Stability, Design, Analytical techniques, Slope stability, Channel erosion, Discharge(Water), Roughness(Hydraulic), Bank erosion, Soil properties, Cohesionless soils, Slopes.
Identifiers: Scour-free channels, River mechanics.

Composite drainage and irrigation systems often contain unlined channels excavated in alluvium or deposits having similar properties. The design and construction of such channels should be accomplished in such a way that erosion and deposition of sediments are hindered in order to prevent serious damage to the environment in the form of scour and consequential shoaling in other parts of the system. This may cause serious ecological damage and have adverse effects on navigation. The possible shapes of stable channel cross sections were discussed and special emphasis was placed upon the one corresponding to mild bed slopes. The basic differential equation for the shape of the wet perimeter of this cross section was established and integrated numerically. The influence of the hydrodynamic lift acting on the topmost layer of grains was taken into consideration by use of Einstein's lift coefficient. All formulas needed for the design and for development of the design charts were given. Final results were presented on a form that allows rapid determination of the shape and size of the cross section when bed slope, discharge, equivalent sand roughness, and soil properties of the bed material are known. (See also W75-05192) (Humphreys-ISWS)
W75-05251

SEDIMENT EQUILIBRIUM CONSIDERATIONS IN THE DESIGN OF IRRIGATION CANAL NETWORKS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Mahmood.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 761-772. 1 fig, 9 ref.

Descriptors: *Sediment control, *Irrigation canals, *Irrigation systems, *Analytical techniques, Sediment discharge, Bed load, Suspended load, Canals, Alluvial channels, Regime, Network design, Sediment transport, Planning, Model studies, Equilibrium, Equations, Flow, Hydraulics.
Identifiers: Regime coefficients.

An irrigation canal network is in sediment discharge equilibrium when bed material inflow over a period of time equals the outflow. A network with 5000 cfs head discharge, resembling the systems in Pakistan, was simulated on a digital computer. The network was studied for the conditions imposed by sediment equilibrium considerations. The analyses of the network showed that: (1) if the system is designed with regime similarity, i.e., constant values of regime coefficients in the system, the uniformity of bed material load concentrations cannot be maintained in the system; (2) the value of alpha greatly affects the characteristics of the system. Alpha was determined by the rate of transport of the bed material, the ratio of the suspended to bed load transport, and the variation of slope along the system. Increasing alpha values for a decreasing size of the channel was found to yield more realistic values of bed material size variation in the system; (3) the bed material transport capacity of irrigation channels reduces with decreasing discharge in spite of the bed material size reduction along the downstream direction; and (4) the topographical controls of irrigation land were not considered. In the analysis of a prototype system the topography of land and the economic values of the variables like water, conveyance channels, channel lining, desilting work, etc. can also be considered to optimize the disposal of sediment. (See also W75-05192) (Humphreys-ISWS)
W75-05252

BED SLOPES OF AGGRADED CHANNELS WITH TWO DEGREES OF FREEDOM,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
S. P. Chee.
In: Sediment Transportation, Volume 1; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 785-794. 1 fig, 1 tab, 12 ref.

Descriptors: *Aggradation, *Hydraulic models, *Sediment transport, *Laboratory tests, Streambeds, Channels, Evaluation, Flow, Depths, Bed load, Beds, Shape, Sediment discharge, Scour, Deposition(Sediments), Dunes, Open channel flow, Hydraulics, Mannings equation, Chezy equation.
Identifiers: Bed load equations, Movable beds.

An investigation of the bed slopes of aggraded channls with two degrees of freedom was conducted with the aid of hydraulic models. Sediment beds were formed in laboratory stream channels by supplying sediment from a calibrated upstream hopper while water was circulated by pumping. Sediment bed slopes, bedforms, and the mechanics of sediment transportation were carefully observed. As the utilization of the bed load equations to calculate sediment discharge, bed slopes, and flow depths would require a

knowledge of bedforms, the better known methods of predicting the type of bedform were studied in relation to these tests and the results were presented. The resistance equations Manning, Chezy, and Liu-Hwang are often used together with the bed load equations of Einstein, Kalinske, and Shields to compute bed slopes and flow depths. The use of the Kalinske bed load equation in conjunction with the Manning formula and taking into account bedform roughness as proposed by Einstein/Doland gave the closest correlation in the computation of sediment slopes. The same set of equations which predicted bed slopes with the greate,t accuracy also provided the closest estimate of flow depths. The determination of bedforms by using Simons' diagram gave sufficiently accurate results. (See also W75-05192) (Humphreys-ISWS)
W75-05254

SCOURING CAPACITY OF FLOW IN NARROW OPEN CHANNELS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
N. T. Zhdankus.
In: Sediment Transportation, Volume i; Proceedings of the International Association for Hydraulic Research Symposium on River Mechanics (4 Vol.), Bangkok, Thailand, January 9-12, 1973. Asian Institute of Technology, Bangkok, Thailand, p 831-839. 2 fig, 1 tab.

Descriptors: *Scour, *Laboratory tests, *Channel erosion, Hydraulic models, Flow, Movement, Evaluation, Velocity, *Open channels, Stream erosion, Turbulent flow, Saltation, Streambeds.
Identifiers: Trapezoidal channels, Movable beds, Permissible velocity, Non-scouring velocity.

The flow and bed interaction mechanism in narrow channels is different from that in wide channels. The difference must be taken into account when permissible (nonscouring) velocities in narrow channels are determined. Laboratory experiments, performed in trapezoidal channel models, showed that usual methods, designated for designing wide channels, can be used for determining permissible velocities in narrow channels, if correction coefficients, taking into account channels' form of cross-section, are used in computations. The correction coefficients were determined from experimental data. Evaluation of experimental data was based on using maximum momentary bottom velocity as the criterion of scouring capacity of flow. Correction coefficients based on laboratory data were tabulated. (See also W75-05192) (Humphreys-ISWS)
W75-05258

MEASURING SEWAGE FLOW USING WEIRS AND FLUMES,
Ontario Ministry of the Environment, Toronto. Project Operations Branch.
For primary bibliographic entry see Field 5D.
W75-05326

8C. Hydraulic Machinery

DISPERSION OF DREDGE SPOIL DUMPED IN NEAR-SHORE WATERS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W75-05167

MEASURING SEWAGE FLOW USING WEIRS AND FLUMES,
Ontario Ministry of the Environment, Toronto. Project Operations Branch.
For primary bibliographic entry see Field 5D.
W75-05326

8D. Soil Mechanics

ESTABLISHMENT OF OPERATIONAL GUIDELINES FOR TEXAS COASTAL ZONE MANAGEMENT: INTERIM REPORT ON RESOURCE CAPABILITY,
Texas Univ. at Austin.
For primary bibliographic entry see Field 2L.
W75-04851

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates, Engineers, San Francisco, Calif.
J. M. Keith, and R. E. Skjei.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-778 740, $4.75 in paper copy, $2.25 in microfiche. Technical Memorandum No. 43, March 1974. 76 p, 16 fig, 4 tab, 8 ref, append. DACW72-73-C-0004.

Descriptors: *Littoral drift, *Bottom sediments, *Islands, Bathymetry, Marine biology, *Ecology, Biota, Marine plants, Retaining walls, *California, Environmental effects.
Identifiers: *Rincon Island(Calif), Causeways.

Rincon Island, Punta Gorda, California, is an offshore island with an ocean exposure man-made in 1958. Located in 45 feet of water, it is composed of armor rock and tetrapod revetments enclosing a sand core. A pile-supported causeway about 2700 feet long connects the island to the shore. Major findings of an evaluation of the island's performance in the more than 14 years of its existence showed: that the revetment had not been damaged by wave attack; that subsidence ranging from about 3 inches to 1.5 feet had occurred, mainly due to the deterioration of some inferior material in the revetment; that littoral transport had been almost unaffected; that adjacent bottom topography showed minor changes; and that a large, thriving community of marine organisms had developed in the environment created by the island. Recommendations for instrumentation to provide measurement of waves and nearby bottom sedimentation were included. (Roberts-ISWS)
W75-05117

8G. Materials

THE CHEMICAL TREATMENT OF COOLING WATER,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 5D.
W75-04964

DEVELOPMENT OF A COMPUTER-AIDED PROCEDURE FOR THE NATIONAL PROGRAM OF INSPECTION OF DAM.,
National Aeronautics and Space Administration, Houston, Tes. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7C.
W75-05134

8I. Fisheries Engineering

WATER POLLUTION AS A CONSTRAINT TO THE DEVELOPMENT OF MARINE FARMING,
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
For primary bibliographic entry see Field 5C.
W75-05013

FISHERY BULLETIN, VOL 69, NO 1, JANUARY 1971,
National Marine Fisheries Service, Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-73-10522, $3.25 in paper copy, $2.25 in microfiche. NOAA XFWFA 69-1. January 1971. 256 p, 77 fig, 85 tab, 284 ref.

Descriptors: *Shellfish, *Marine fish, Ecology, Fish physiology, Metabolism, Larvae, Reproduction, Proteins, Distribution, Pacific Ocean, Productivity, Growth rates, Oregon, Phytoplankton, Fish food organisms, Fish diseases, Chlorophyll, Shrimp, Model studies, Salmon, Fish management, Food processing industry, Proteins, Storage, Fish harvest, Fourier analysis, Hawaii, Organoleptic properties, Herrings, Fish farming.
Identifiers: Euphausia pacifica, Urophycis chuss, Cyprinodon macularius, Bairdiella icistia, Penaeus aztecus, Merluccius products, Clupea harengus pallasi.

Thirteen reports and two notes are presented on fishery science and fish processing. Kind and abundance of fish larvae in the eastern tropical Pacific are described. The abundance, accelerated growth rates, and size structure of Euphasia pacifica off Oregon were investigated. Phytoplankton production and ecological efficiency of a pelagic mysic shrimp were estimated. A linear-programming model was constructed to allocate the salmon catch among the days of the salmon run. One study determined whether cooking lean, whole fish before they are extracted by solvent affects the chemical nutritional characteristics of the resulting protein concentrate. Red hake, Urophysis chuss, stored in ice is suitable for fish protein concentrate production. The desert pupfish, Cyrinodon macularius, may be reared in the laboratory for study. Capture, transport, disease treatment, and laboratory maintenance of the gulf croaker, Bairdiella icistia, are described. Harmonic functions have been fitted to time-series, sea-surface temperatures and salinities to facilitate studies of the oceanographic climate near Hawaii and Christmas Island. Flavoring materials to mask the fish oil odor in pharmaceuticals were investigated. The larval and first postlarval stages of the brown shrimp are described. Protein autolysis rate was determined on hake and Pacific herring as it affects the yield of protein concentrates. (See also W75-05017 thru W75-05031) (Jones-Wisconsin)
W75-05016

KIND AND ABUNDANCE OF FISH LARVAE IN THE EASTERN TROPICAL PACIFIC, BASED ON COLLECTIONS MADE ON EASTROPAC I,
National Marine Fisheries Service, La Jolla, Calif. Fishery-Oceanography Center.
E. H. Ahlstrom.
Fishery Bulletin, Vol 69, No 1, p 3-77, 1971. 15 fig, 29 tab, 36 ref.

Descriptors: *Marine fish, *Larvae, *Pacific Ocean, *Tropical regions, Euphotic zone, Surveys, Varieties, Distribution.
Identifiers: California current.

Most oceanic fishes' pelagic eggs and/or larvae are distributed in or just below the photic zone, i.e., within the upper 150 to 200 m. Once larvae were identified and enumerated, it became obvious that this was an exceptionally useful tool for evaluating fish resources. Kinds and counts of fish larvae were obtained in 482 oblique plankton hauls taken over an extensive area of the eastern tropical Pacific on EASTROPAC I, a four-vesses cooperative survey during February-March 1967. On the basis of larvae abundance, the dominant fish group in oceanic waters are the myctophid lanternfishes (47%), gonostomatid lightfishes (23%), hatchet fishes, Sternoptychidae (6%), bathylagid smelts (5%). Scombrid larvae ranked fifth, and exceeded 2%. Two kinds of larvae were outstandingly abundant: larvae of the lanternfish Diogenichthys laternatus made up over 25% of the total, while larvae of the gonostamatid genus Vinciguerria made up almost 20%. More fish larvae were obtained per haul, on the average, in the eastern tropical Pacific than were obtained per haul in

the intensively surveyed waters of the California Current region off California and Baja California. (See also W75-05016) (Jones-Wisconsin)
W75-05017

SIZE STRUCTURE AND GROWTH RATE OF EUPHAUSIA PACIFICA OFF THE OREGON COAST,
Oregon State Univ., Corvallis. Dept. of Oceanography.
M. C. Smiles, Jr., and W. G. Pearcy.
Fishery Bulletin, Vol 69, No 1, p 79-86, 1971. 5 fig, 1 tab, 30 ref. NSF GB-5494, AEC AT(45-1)-1750; RLO 1750-50.

Descriptors: *Marine animals, *Crustaceans, *Size, *Growth rates, *Oregon, Coasts, Fish food organisms, Pacific Ocean, Ecological distribution, Larvae, Spawning.
Identifiers: *Euphausia pacifica.

Euphausiids are an important food for many marine carnivores. Euphausia pacifica is one of the most abundant euphausiids in the North Pacific Ocean. Dense populations are found in subartic and transitional waters and off the Oregon coast. Because growth rates are needed to understand the ecology and energetics of a species, this study was undertaken on the abundance, size structure, and growth rate of E. pacifica off Oregon, where it has a maximum life expectancy of about 1 year; during this time it grows rapidly to a length of 22-24 mm. Furcilia larvae were found throughout the year but were most abundant during the autumn months. The population density and the proportion of juveniles was higher within 25 miles of the coast than in offshore oceanic waters. Growth rates off Oregon are about twice those previously reported for this species from other regions. Spawning also appears to be latter in the year. All these features may be explained by the high primary production which is extended throughout the summer by coastal upwelling and by the lack of wide seasonal fluctuations of water temperatures along the Oregon coast. (See also W75-05016) (Jones-Wisconsin)
W75-05018

ESTIMATING PHYTOPLANKTON PRODUCTION FROM AMMONIUM AND CHLOROPHYLL CONCENTRATIONS IN NUTRIENT-POOR WATER OF THE EASTERN TROPICAL PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W75-05019

A LINEAR-PROGRAMMING SOLUTION TO SALMON MANAGEMENT,
Washington Univ., Seattle. Center for Quantitative Science; and Washington Univ., Seattle. Fisheries Research Inst.
B. J. Rothschild, and J. W. Balsiger.
Fishery Bulletin, Vol 69, No 1, p 117-140, 1971. 9 fig, 3 tab, 9 ref.

Descriptors: *Linear programming, *Salmon, *Fish management, *Value engineering, Fish harvest, Alaska, Economic efficiency, Decision making, Sockeye salmon.
Identifiers: *Salmon-run allocation, Bristol Bay(Alaska).

A linear-programming model was constructed to allocate the catch of salmon among the days of the salmon run. The objective of the model was to derive a management schedule for catching the salmon which would result in maximizing the value of the landings given certain constraints. On some occassions, the catch is limited by the cannery capacity. Because of the uncertainty of the constraint needed, the model was examined under a variety of escapement conditions, but keeping under each set, what would appear to be a conservatively high male-to-female ratio of at least one male for every three females. The shadow prices are useful in considering various management implications, for example, the egg shadow prices, the cannery shadow prices, and the run shadow prices. An an example, the model was applied to a run of sockeye salmon in Bristol Bay, Alaska. It indicated that the required processing time could be reduced by several days and the value of the fish on the dock increased. (See also W75-05016) (Jones-Wisconsin)
W75-05021

CHEMICAL AND NUTRITIONAL CHARACTERISTICS OF FISH PROTEIN CONCENTRATE PROCESSED FROM HEATED WHOLE RED HAKE, UROPHYCIS CHUSS,
National Marine Fisheries Service, College Park, Md. National Center for Fish Protein Concentrate.
For primary bibliographic entry see Field 3E.
W75-05022

EFFECT OF ICE STORAGE ON THE CHEMICAL AND NUTRITIVE PROPERTIES OF SOLVENT-EXTRACTED WHOLE FISH--RED HAKE, UROPHYCIS CHUSS,
National Marine Fisheries Service, College Park, Md. National Center for Fish Protein Concentrate.
For primary bibliographic entry see Field 3E.
W75-05023

LABORATORY REARING OF THE DESERT PUPFISH, CYPRINODON MACULARIUS,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
D. Crear, and I. Haydock.
Fishery Bulletin, Vol 69, No 1, p 151-156, 2 tab, 16 ref.

Descriptors: *Fish, *Laboratory animals, *Spawning, *Killifishes, Technology, Fish reproduction, Laboratory tests, Bioassay, Fish conservation, Fish diseases.
Identifiers: *Desert pupfish, *Euryhaline fish.

The desert pupfish, Cyprinodon macularius is a killifish (Cyprinodontidae native to the Lower Colorado River Basin from southern Arizona to southern California and the Sonoyta River of northern Sonora, Mexico. Its ability to survive in harsh desert environments, plus other important biological characteristics renders it an exceptionally hardy laboratory animal potentially valuable for research in the study of embryology, genetics, physiology, and behavior. It is euryhaline (0-70 salinity) and eurythermal (8-44.6C) and may be useful as a bioassay for either freshwater or marine pollutants. The recent introduction of exotic species and the encroachment of civilization in the Salton Sea area of California have drastically reduced the formerly abundant pupfish populations. Laboratory rearing eliminates the need for continuous exploitation of a rapidly contracting natural population and could supply adequate stocks for sanctuaries, thereby preserving the species from extinction. Laboratory apparatus and conditions are described for maintaining larval and adult pupfish. Parasites and diseases encountered are discussed and successful treatments described. Methods for spawning and rearing the desert pupfish in the laboratory are detailed. (See also W75-05016) (Jones-Wisconsin)
W75-05024

GONAD MATURATION AND HORMONE-INDUCED SPAWNING OF THE GULF CROAKER, BAIRDIELLA ICISTIA,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
I. Haydock.
Fishery Bulletin, Vol 69, No 1, p 157-180, 1971. 3 fig, 12 tab, 51 ref.

Descriptors: *Laboratory animals, *Fish reproduction, *Gonads, *Spawning, Salinity, Marine fish, Bioassay, Life cycles, Sexual maturity.
Identifiers: *Gulf croaker, Bairdiella icistia.

The use of hormones was studied in inducing maturation and spawning of the gulf croaker, Bairdiella icistia, both for obtaining eggs for physiological studies of salinity tolerance and for studying factors which influence spawning in marine fishes. Once spawning fish under controlled laboratory conditions had been achieved, influences of biological and physical factors on the spawning process were examined in detail. Succesful methods of capture, transport, disease treatment, and laboratory maintenance of the gulf croaker are described. Gonad maturation was achieved out of season by use of appropriate controlled photoperiods, temperatures, and abundant feeding. Mature fish or fish brought to maturity in the laboratory were spawned with suitable hormone injections and the time of spawning could be accurately predicted. Eggs obtained from hormone-induced spawning were normal in all respects and the larvae were reared through metamorphosis using rotifers and brine shrimp nauplii as food; thus, the life history of this marine fish can, for the first time, be completed under controlled laboratory conditions. The techniques developed for croakers may apply to mariculture, bioassay of marine pollution, and in general research on marine fish reproduction. (See also W75-05016) (Jones-Wisconsin)
W75-05025

HARMONIC FUNCTIONS FOR SEA-SURFACE TEMPERATURES AND SALINITIES, KOKO HEAD, OAHU, 1956-69, AND SEA-SURFACE TEMPERATURES, CHRISTMAS ISLAND, 1954-69,
National Marine Fisheries Service, Monterey, Calif. Environmental and Fishery Forecasting Center.
For primary bibliographic entry see Field 2L.
W75-05026

MASKING UNDESIRABLE FLAVORS IN FISH OILS,
California Univ., Davis. Dept. of Food Science and Technology.
G. Jellinek, and M. E. Stansby.
Fishery Bulletin, Vol 69, No 1, p 215-222, 1971. 1 fig, 3 tab, 4 ref.

Descriptors: *Fish, *Oil, Organoleptic properties, Atlantic menhaden.
Identifiers: *Pharmaceuticals.

Consumer-type panels tested flavoring materials, approved by the Food and Drug Administration, added to medicinal menhaden oil (the fish oil produced in the largest quantity in the United States) to determine its palatability after various storage periods. During a search for suitable masking materials, fresh, specially refined menhaden oil, having a minimum of flavor, was stored with and without added flavoring materials for 5 days at 75F and for longer periods at several lower temperatures. In initial preliminary screening tests with 66 different flavoring materials, the masking of rancid or other unpalatable flavors developing in the stored oil was evaluated by a small panel. In later tests, a larger panel consisting of untrained laboratory personnel was used to determine the preference for the flavors of those materials that were most acceptable in the screening test. Several flavoring materials showed promise, particularly those having the flavor of root beer, lemon, wintergreen (methyl salicylate), and wild cherry. (See also W75-05016) (Jones-Wisconsin)
W75-05027

EARLY DEVELOPMENTAL STAGES OF THE BROWN SHRIMP, PENAEUS AZTECUS IVES, REARED IN THE LABORATORY,
National Marine Fisheries Service, Galveston, Tex. Biological Lab.
H. L. Cook, and M. A. Murphy.
Fishery Bulletin, Vol 69, No 1, p 223-239, 1971. 13 fig, 1 tab, 6 ref.

Descriptors: *Shrimp, *Embryonic growth stage, *Larvae, Growth stages, Systematics, Gulf of Mexico, Pink shrimp, Commercial shellfish.
Identifiers: *Brown shrimp, White shrimp.

Thirteen species of panaeid shrimp representing five genera inhabit the shallow nearshore waters of the northwestern Gulf of Mexico. At this time their larvae can only be identified the genus. Within genera the larvae are so similar morphologically that at any given stage the various species cannot yet be distinguished. To answer basic questions about larval distribution, growth, and survival of each species, accurate identification of larvae is essential. The larval and early postlarval stages of the pink shrimp and of the white shrimp had been described. These shrimp have five nauplial, three protozeal, three mysis, and several postlarval stages. Their morphological characteristics during these states are so alike that biologists still encounter difficulty in differentiating them. since the early developmental stages of the brown shrimp have not been described, the larval and first postlarval stages of the brown shrimp, Panaeus aztecus, reared from eggs spawned in the laboratory, as well as the eggs themselves, are described and illustrated. The larvae and first postlarva are compared with those of the pink shrimp, P. duorarum and white shrimp, P. setiferus. (See also W75-05016) (Jones-Wisconsin)
W75-05028

PROTEIN AUTOLYSIS RATES AT VARIOUS PH'S AND TEMPERATURES IN HAKE, MERLUCCIUS PRODUCTUS, AND PACIFIC HERRING, CLUPEA HARENGUS PALLASI, OF FISH PROTEIN CONCENTRATE,
National Marine Fisheries Service, Seattle, Wash. Technology. Lab.
B. Koury, J. Spinelli, and D. Weig.
Fishery Bulletin, Vol 69, No 1, p 241-246, 1971. 6 fig, 11 ref.

Descriptors: *Marine fish, *Food processing industry, *Proteins, Hydrogen ion concentration, Temperature, Herrings, Enzymes.
Identifiers: *Autolysis rates, *Fish protein concentrate, Pacific herring, Hake.

Production of fish protein concentrate requires a process that efficiently removes oil and water from the fish and provides high protein yields. Although FPC can be prepared by several different methods, the most effective procedures developed to date are based on systems in which comminuted fish is successively extracted with a suitable solvent system. The endogenous proteolytic enzymes in fish hydrolyze the proteins into subunits that are not coagulable by the isopropanol concentration normally used in the preparation of FPC. The preparation FPC made from autolyzing hake showed that the yield bore a close inverse relation to the degree of autolysis. The autolysis rate in Pacific herring and hake were related to pH and temperature, the rates showing an increase with increasing temperature, the rates showing an increase with increasing temperature and a decreasing pH. Maximum activity was reached at about 50C. Inactivation of the enzymic systems occurred when temperatures exceeded 70C. Since the economic success of any method that is used for the preparation of FPC is largely dependent on the yield of finished product obtained from a given amount of raw material, autolysis rates are a process parameter that should be closely controlled. (See also W75-05016) (Jones-Wisconsin)
W75-05029

EQUIPMENT FOR HOLDING AND RELEASING PENAEID SHRIMP DURING MARKING EXPERIMENTS,
National Marine Fisheries Service, Galveston, Tex. Biological Lab.
D. A. Emiliani.
Fishery Bulletin, Vol 69, No 1, p 247-250, 1971. 8 fig, 2 ref.

Descriptors: *Laboratory equipment, *Marking techniques, *Shrimp, Fish handling facilities.
Identifiers: Shrimp holding tanks.

The factors considered in the design of a shrimp holding tank are that it had to be relatively light in weight, require little maintenance, and be nontoxic to shrimp. Provisions also were needed to permit rapid water exchange, minimize water turbulence within the tank, and control water temperature. The tank design described in detail meets these specifications and has proved successful for both sea- and land-based operations. To protect shrimp from exposure to predation during their return to the sea floor, an expendable release canister is described which can be put overboard while a vessel is underway, and a release tube for use in shallow water. The canister is constructed of high-impact styrene plastic formed into a hollow cylinder. The design and operation of the canister and release tube are detailed. (See also W75-05016) (Auen-Wisconsin)
W75-05030

AN ADULT BLUEFIN TUNA, THUNNUS THYNUSS, FROM A FLORIDA WEST COAST URBAN WATERWAY,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
R. W. Topp, and F. H. Hoff.
Fishery Bulletin, Vol 69, No 1, p 251-252, 1971. 7 ref.

Descriptors: *Marine fish, *Florida, *Distribution, Gulf of Mexico.
Identifiers: *Bluefin tuna.

The unusual occurrence and capture on May 10, 1970 of a bluefin tuna in the Florida west coast waterway near Hudson adds to the information on the origin and distribution of Gulf of Mexico bluefin tuna stocks. The female specimen, captured with harpoons, weighted 239 kg, was 244 cm in fork length, and 168 cm in girth. Histological examination indicated recent spawning. It is speculated that the specimen is from Caribbean stock or from a stock wintering in the Gulf of Mexico. (See also W75-05016) (Auen-Wisconsin)
W75-05031

RESULTS OF CROSSING BETWEEN WILD AND DOMESTIC CARP (CYPRINUS CARPIO L.), (IN GERMAN),
Institut fuer Binnenfischerei, Berlin (East Germany).
W. Steffens.
Biol Zentralbl. Vol 93, No 2, p 129-139. 1974, Illus.
Identifiers: *Breeding, *Carp(Hybrid), Cyprinus-Carpio, Fish production, Production.

During a hybridization test, domestic female mirror carp were mated with male wild carp, the hybrids then being bred in ponds--for 3 yr--together with pure domestic mirror carp. During the 1st and 2nd breeding yr, the individual weight increase of the hybrids was a little lower than or equal to that of the domestic carp. However, the smaller losses of the hybrids made possible a more favorable increase per ha during these 2 yr. During the 3rd breeding yr there was a lower weight increase of the single fish and also a lower increase in area, with very small losses. As to their body form the hybrids are more slender than the domestic carp. The factors of corpulence of the hybrids are closer to those of the domestic carp than to those of the wild carp. In content of Hb and the number of erythrocytes there is not a difference between the hybrids and the domestic carp. Since there is no interest in scaled carp as edible fish, proposals are made for the production of hybrids back-crossed with mirror carp.--Copyright 1974, Biological Abstracts, Inc.
W75-05164

PRIMARY AND BACTERIAL PRODUCTION OF SOME FISHERY PONDS OF THE VOLGA DELTA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
A. F. Sokol'skii.
Gidrobiol Zh. Vol 9, No 6, p 77-82. 1973, Illus.
Identifiers: *Bacterial production, Carp, Deltas, Fertilizers(Organic), *Fishery ponds, *Primary production, Sturgeion, *USSR(Volga delta).

Data are presented on the primary and bacterial production of 2 carp finishing ponds and 2 carp and 2 sturgeon fingerling ponds in the Volga delta (USSR), with and without the application of fertilizer. The role of bacterioplankton in production was very low, which indicated a need to increase the application of organic fertilizers.--Copyright 1974, Biological Abstracts, Inc.
W75-05334

9. MANPOWER, GRANTS AND FACILITIES

PUERTO RICO NUCLEAR CENTER, ANNUAL REPORT, 1973.
Puerto Rico Univ., San Juan.
For primary bibliographic entry see Field 5A.
W75-05350

9A. Education (Extramural)

ANNUAL REPORT, FY 1974, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W75-04937

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1973-JUNE 30, 1974.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9D.
W75-05266

9C. Research Facilities

WORLD DIRECTORY OF ENVIRONMENTAL RESEARCH CENTERS.
For primary bibliographic entry see Field 10D.
W75-04971

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT, FY 1974, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service Springfield Va 22161 as PB-239 794, $4.25 in paper copy, $2.25 in microfiche. Report UNC-WRRI-74-00, (1974), 72 p. OWRT A-999-NC(44), 14-31-0001-3533.

Descriptors: *Water Resources, Education, *North Carolina, *Water Resources Institute, Research and development, Universities, Training, Projects, Grants, Contracts.

The Water Resources Research Institute is The university of North Carolina's water research center. Located at N.C. State University at Raleigh, the Institute serves all sixteen campuses of the University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 26-man Advisory Committee representative of State and Federal water agencies, industry, conservation, agriculture, local government, and the general public provides program guidance and review. The Institute's research program for FY 1973-74 was supported by an annual allotment and 13 matching grants from the Office of Water Research and Technology, USDI; a grant from EPA; matching State appropriations; matching funds from Pickle Packers International, Inc.(made direct to the principal investigator); and grants from the Division of Environmental Management, N.C. Department of Natural and Economic Resources. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1973-74, projects were conducted at N.C. State University, University of North Carolina at Chapel Hill, Duke University, and East Carolina University. (Howells-North Carolina State)
W75-04937

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1973-JUNE 30, 1974.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 953, $4.75 in paper copy, $2.25 in microfiche. University of California Water Resources Center Report No. 30, February 1975, 90 p. OWRT A-999-CAL(9).

Descriptors: Project planning, *Research and development, Water resources, *California, *Water Resources Institute, Universities, Training, Grants, Contracts, *Projects, Project purposes.

The principal investigators of fresh water projects sponsored by the University of California Water Resources Center have submitted their annual reports, from which the most essential information has been abstracted. The narratives have been purposely kept brief. Each emphasizes, wherever possible, the hard results and the actual or potential applications of those results to benefit affected interests. Shown also are starting and scheduled ending dates for each research project. The reader may infer from these the relative degree of progress achieved to date, together with an indication of when further information might become available--usually at least six months after completion of the project for any detailed account. Both State of California and Federally funded research activities are included. (Snyder-Californi, Davis)
W75-05266

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

INFORMATION SYSTEMS IN ENVIRONMENTAL RESEARCH AND DECISION-MAKING,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 6B.
W75-05301

WAMIS--A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT,
Arizona Unov., Tuscon. Dept. of Watershed Management.
L. M. White.
Arizona Water Resources Project Information, Project Bulletin No 6, August 1974, 3 p. OWRT A-042-ARIZ(5) 14-31-0001-3803.

Descriptors: *Information retrieval, *Bibliographies, *Water yield improvement, *Vegetation effects, *Land management, *Watershed management, Forest management, Water yield, Water sources, Arizona, Southwest U.S., Computers.

A computer is being used to provide references to other research efforts and published results of studies for water resource managers, through the Watershed Management Information System (WAMIS), at the University of Arizona. This bibliographic information system centers on research relevant to the development of the Arizona Watershed Program. The primary topic covered in WAMIS is vegetation management practices and treatments (Such as clearcutting, conversion, chemical controls, or burning) and their effects on water, other natural resources, or resource-based products in the treated areas. By storing the citations to appropriate documents and their abstracts on computer tape and by indexing them according to their content, not by just words used in the title of the citation, WAMIS can respond to individual requests for bibliographic references on a specific basis or a general basis, depending on the needs of the user, who receives a computer printout of citation, abstract, and keywords. Documents are indexed under a varity of keywords, such as interception, erosion control, livestock, timber management, forage production, land use, and wildlife management. WAMIS works in cooperation with the Arid Lands Information System, also at the University of Arizona. (See also W75-05303)
W75-05302

A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,
Arizona Univ., Tucson. Dept. of Watershed Management.
L. M. White.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 4, p 231-235, Proceedings of the 1974 meetings of the American Water Resources Association, Arizona Section, and the Arizona Academy of Science, Hydrology Section, Flagstaff, Arizona, April 19-20, 1974. 1 fig, 2 ref. OWRT A-042-ARIZ(4) 14-31-0001-3803.

Descriptors: *Information retrieval, *Bibliographies, *Water yield improvement, *Vegetation effects, *Land management, *Watershed management, *Arizona, Forest management, Water yield, Water sources, Southwest U.S., Computers.

Effects of vegetation management on water and other renewable natural resources and amenities are subjects of a computerized reference retrieval information system operated out of the Department of Watershed Management, University of Arizona. Although WAMIS (Watershed Management Information System is a subsystem of the Arid Lands Information System, it has its own unique scope. The system, which serves as a link between bibliographic material and users who need access to the information, provides a personalized bibliography for the user in his area of interest. Documents identified as relevant to the system's scope are abstracted and indexed, and references stored in a computer bank. In response to specific inquiries from users, the computer tapes are searched under indexing terms, author, and/or data, and a printout of citations (Giving author, data, title, source, abstract, and indexing terms) relevant to the inquiry is sent to the user. (See also W75-05302)
W75-05303

10B. Reference and Retrieval

TECHNIQUES FOR TRACING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W75-04889

BIBLIOGRAPHY OF WATER POLLUTION CONTROL BENEFITS AND COSTS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W75-05077

LIVESTOCK AND THE ENVIRONMENT, A BIBLIOGRAPHY WITH ABSTRACTS,
East Central State Coll., Ada, Okla. School of Environmental Science.
R. H. Ramsey.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $3.50. Environmental Protection Agency, Technology Series Report, EPA-660/2-74-024, April 1974, 357 p. R801454.

Descriptors: *Bibliographies, Cattle, Sheep, Hogs, Poultry, *Fish farming, *Feedlots, *Confinement pens, *Research and development, *Farm wastes, Waste identification, Waste treatment, Waste storage, Waste disposal, Agricultural runoff, Abstracts.
Identifiers: *Waste management, Title index, Author index, Keyword index, Animal information categories index.

Management and research information on animal wastes has expanded rapidly in recent years. This material has appeared in diverse sources such as journal articles, conference proceedings papers, university or government publications, magazine articles, books, and theses. This bibliography (an updated and revised extension of the BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT EPA-R2-72-101 which was published by J. R. Miner, D. Bundy, and G. Christenbury at Iowa State University, See W73-06214) was compiled in order to speed the flow of information on findings in one segment of the livestock industry to other segments that could benefit from this technology. Included are the following indexes: (1) title, (2) author, (3) keyword, (4) animal information categories. These indexes are followed by a section of abstracts of each reference entry found in the bibliography. Single copies of most articles can be obtained in hard copy or microfiche form at cost from the Animal Waste Technical Information Center, School of Environmental Science, East Central State College, Ada, Oklahoma 74820. (EPA)
W75-05084

WATER RESOURCES DEVELOPMENT, 1950-1965, AN INTERNATIONAL BIBLIOGRAPHY,
Center of Scientific and Technological Information, Tel Aviv (Israel). Library Services.
H. Wellisch.
Israel Program for Scientific Translations, Jerusalem (Israel), p 135, 1967.

Descriptors: *Bibliographies, *Water resources, Water chemistry, Hydraulic equipment, Hydrodynamics, Irrigation, Drainage, Public health, Waste treatment, Water resources development, Water supply, Water treatment, Documentation, Information retrieval.

This bibliography is composed of three parts. Part I contains a listing of over 1780 books and monographs, arranged in classified order according to the Universal Decimal Classification (UDC). Two subject indexes were provided, an alphabetical subject index and a subject index by UDC num-

bers. A name index contains names of authors, editors, translators, and corporate bodies both as authors and sponsoring agencies. Part II contains a list of 142 periodicals and yearbooks, along with a subject index. Part III has a tabulation of abstracting and indexing services, also a subject index. Catagories of the Part III subject index are: chemistry of water, hydraulic machines, hydrodynamics, hydrology, irrigation and drainage, public health engineering, waste treatment, water resources development, water supply, and water treatment. (Sims-ISWS)
W75-05154

INFORMATION SYSTEMS IN ENVIRONMENTAL RESEARCH AND DECISION-MAKING,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 6B.
W75-05301

WASTEWATER COLLECTION (LITERATURE REVIEW),
Nottingham (H.D.) and Associates, McLean, Va.
For primary bibliographic entry see Field 5D.
W75-05335

10C. Secondary Publication And Distribution

A REVIEW OF THE LITERATURE CONCERNING THE STEEL INDUSTRY AND POLLUTION. PART 1. THE BACKGROUND TO POLLUTION,
British Steel Corp., Sheffield (England). Information Services.
For primary bibliographic entry see Field 5G.
W75-05093

BIBLIOGRAPHIES PERTINENT TO WILDLAND HYDROLOGY,
Utah State Univ., Logan. Dept. of Range Science.
G. F. Gifford.
Watershed Science Unit Bibliography Series No 2, p 9, 1975.

Descriptors: *Bibliographies, *Hydrology, *Watershed management, *Water resources, *Water pollution, Remote sensing, Wastes, Thermal pollution, Runoff, Erosion, Groundwater, Geothermal studies, Droughts, Evapotranspiration, Evaporation control, Strip mines, Sedimentation, Snowmelt, Forest fires, Economics, Documentation, Information retrieval.
Identifiers: Wildlands, Botany.

Listed were 94 bibliographical entries related to wildland hydrology. Subject areas covered were very broad and included, but were not limited to, the following catagories: hydrology, remote sensing, watershed management, water resources, wastes, water pollutin, thermal pollution, runoff, erosion, groundwater, geothermal resources, droughts, evapotranspiration, evaporation suppression, strip-mine reclamation, sedimentation, snow hysrology, forest fires, botany, and economics. (Sims-ISWS)
W75-05153

10D. Specialized Information Center Services

ENVIRONMENT U.S.A.: A GUIDE TO AGENCIES, PEOPLE, AND RESOURCES.
For primary bibliographic entry see Field 6G.
W75-04946

WORLD DIRECTORY OF ENVIRONMENTAL RESEARCH CENTERS.
Oryx Press/R. R. Bowker Company (New York and London), 2nd Edition, 1974, 330 p. W K Wilson, M D Dowd, and P Sholtys, editors.

Descriptors: *Research facilities, *Environmental, Biology, Engineering, Geology, Physics, Social aspects, Personnel, Administration, Organizations, Education, Governments, Professional societies, Industries, Laboratories, Institutions, Water resources.
Identifiers: *Directories.

This list of global research institutes concerned with environmental biology, chemistry, engineering, geology, physics, social sciences, and interdisciplinary studies gives the names, addresses, and directors/administrators of various educational-academic, government, professional, industrial-commercial, and miscellaneous organizations in two sequencies, namely, by discipline and by country. (Brown-IPC)
W75-04971

MASS MEDIA HANDBOOK FOR WATER RESOURCES RESEARCH DIRECTORS,
Missouri Univ., Columbia. Coll. of Agriculture.
For primary bibliographic entry see Field 06B.
W75-05261

10F. Preparation Of Reviews

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Nottingham (H.D.) and Associates, McLean, Va.
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A. CENTERS OF COMPETENCE		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W75-05342--05350	9
Cornell University, Policy Models for Water Resources Systems	W75-05315--05322	8
Franklin Institute (FIRL), Municipal Wastewater Treatment Technology	W75-04856 04977--04979 04981--04995 04997--05000 05323--05333 05335	35
Illinois State Water Survey, Hydrology	W75-04914--04928 05091--05093 05095--05101 05103--05163 05165--05171 05176--05182 05184--05259 05339	177
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W75-04940--04976 05340--05341	39
University of North Carolina, Metropolitan Water Resources Planning and Management	W75-04851--04855	5
University of Wisconsin, Eutrophication	W75-04891--04906 04908--04913 05016--05019 05021--05055 05057--05058 05060 05062--05064 05066--05067 05337--05338	71

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B. STATE WATER RESOURCES RESEARCH INSTITUTES		
Alabama Water Resources Research Institute	W75-05264--05265	2
Arizona Water Resources Research Center	W75-05302--05303	2
California Water Resources Center	W75-05266	1
Colorado Environmental Resources Center	W75-05260	1
Connecticut Institute of Water Resources	W75-05304	1
Georgia Environmental Resources Center	W75-05267--05271	5
Illinois Water Resources Center	W75-04933	1
Indiana Water Resources Research Center	W75-05172--05173 05305	3
Kansas Water Resources Research Institute	W75-04934	1
Maryland Water Resources Research Center	W75-04935, 05174 05272	3
Missouri Water Resources Research Center	W75-05175	1
New Hampshire Water Resources Research Center	W75-05306	1
New Jersey Water Resources Research Institute	W75-05273	1
New York Water Resources and Marine Sciences Center	W75-04936	1

SOURCE	ACCESSION NUMBER	TOTAL
B. STATE WATER RESOURCES RESEARCH INSTITUTE (Continued)		
North Carolina Water Resources Research Institute	W75-04937	1
Pennsylvania Institute for Research on Land and Water Resources	W75-05274--05275	2
South Dakota Water Resources Institute	W75-04938	1
Utah Center for Water Resources Research	W75-04939	1
Washington Water Research Center	W75-05307	1
C. OTHER		
BioSciences Information Service	W75-04857, 04873 04877, 04885 04907, 04980 04996, 05020 05056, 05059 05061, 05065 05073, 05094 05102 05164, 05183 05276, 05334 05336	20
Effects of Pollutants on Aquatic Life (Katz)	W75-05001--05015	15
Engineering Aspects of Urban Water Resources (Poertner)	W75-04858--04869	12
Environmental Protection Agency	W75-05068--05072 05074--05090 05308--05314	29

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C. OTHER (Continued)		
Environment Canada	W75-04870--04872 04874--04876 04878--04884 04886--04890	18
Office of Water Research and Technology	W75-04929--04932 05261--05263	7
Vanderbilt University, Metals Pollution	W75-05277--05301	25

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

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